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PRINCETON COLLEGE
BULLETIN

JANUARY 1889

EDITED BY THE
PRESIDENT AND MEMBERS OF THE FACULTY

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VOL. I.

JANUARY, 1889.

No. 1.

EDITORIAL.

We lay before our readers the first number of the PRINCETON COLLEGE BULLETIN. Those who have undertaken its management, believe that a publication of this kind has long been needed. It will deal editorially and through signed articles with the educational questions that affect our interests in this seat of learning as well as those of other institutions. It will give original notes and contributions from the different departments of the college; summaries of papers read before the Princeton Scientific and Philosophical Clubs and before other learned bodies outside of Princeton, as well as of papers published in special periodicals by members of the Faculty, notes of current interest and information and announcements of new courses. In short it will aim to give some idea of what the Faculty and Fellows of Princeton College are doing in the different departments of intellectual activity, of the changes in our curriculum by the addition of new courses or subjects, and of the necessities that arise in connection with the development of the College.

THE BULLETIN will thus not only be a means of communication between the Faculty, and the Graduates, Undergraduates and special friends of Princeton College, but will also address itself to the wider circle of kindred institutions, and the general cultured public. Besides recording, for those whom it may concern, the progress and needs of the institution, it may help to bring together those engaged in the different departments of investigation in the

College, who often drift apart and know little of each other, either by reason of their absorption in special pursuits, or for want of a medium for the interchange of ideas.

By giving the results of inquiry in different lines of thought, it may serve in a measure also to quicken thought and to stimulate inquiry; and so likewise to dissipate the idea that still lingers in the minds of some that a professor's sole duty is to teach.

We believe that the graduates will have their interest strengthened by means of an agency which will keep them informed concerning everything that affects the material, moral, and intellectual development of the College.

It is hoped that the BULLETIN will secure sufficient support to justify its appearance three or four times during the academic year.

THE PRESIDENT'S ADDRESS AT THE OPENING OF THE COLLEGE.

SEPTEMBER 12th, 1888.

For the man of letters who is supposed to despise the follies and fashions of the gay world, whose real world is one of ideas, and whose companions are mostly of the silent sort, this month of September that empties the hotels and fills the schools, that sends the professor who has been loitering by the sea or who has summered high in his favorite mountain retreat, back to the duties of the class-room—should possess peculiar interest. Not that I despise the long vacation, for I have been accustomed to think

that it goes far toward making up for the hardships of our professorial life. I can submit to the limitations of my lot more comfortably, and forego the luxuries of my successful business friend with more equanimity when I remember that he takes no vacation. Let me not comfort myself too much, however, for the professor's time will come after the clergyman's, in all probability, and the public will want to know by and by perhaps, why so much capital is kept idle, and why our colleges are not in operation through July and August. Perhaps we shall be detailed to conduct summer schools, and shall learn, as well as others, how to teach French and German by correspondence and to move through the circle of the sciences in six weeks. There is a popular misunderstanding upon the subject of vacations. A man does not stop teaching because he needs physical rest so much, but because he needs mental reinforcement. The summer is our time for reading. It is the time a man has for doing some work in his department beyond the actual demands made upon him by the class-room. And the vacation is none too long. It is very questionable, indeed, whether we should not get better results if it were longer. And I am not sure but that the system that some colleges have adopted, of allowing their professors at certain intervals a somewhat extended furlough, for the purpose of enabling them to do special work in their departments, is the way to make a professor's time in the long run most beneficial to the institution that is served by his brain.

My partiality for the month of September, therefore, must not be taken to mean that I have never felt it a little irksome to step into the traces, and that I have not felt the collar rub as I moved on with my accustomed load—if the little that I have been in the habit of doing may be so called—of academic duty. But I own to a somewhat different feeling this year. It is prob-

ably because the work was new, the position an unaccustomed one, and that I was anxious to see how I felt in it that I have been anticipating this moment with peculiar satisfaction for a month.

And so, standing here to-day in the discharge of my first official duty as President of the College, I bid you all a hearty welcome to the work and the privileges of this college session. We have reason to thank God for his goodness to us as a Faculty during the time of our separation. We have been kept in good health. Most of us are here to-day to speak for ourselves, and of those who are not here we have tidings that they are well. Some of our colleagues have spent the summer prosecuting the studies germane to their departments in foreign lands, and from one at least of these I have heard enthusiastic accounts of what he has been doing. It is the fact that the present session is my first appearance as the head of this college that accounts for the presence of so large an audience this afternoon. I take it as an indication of your kindly interest in my work, and, while I thank you most sincerely, I would take this opportunity to solicit your continued interest in the College, whether you sustain immediate relations to it as your Alma Mater, or whether you only feel the interest which one naturally has in one of the leading institutions of his town. I fear, however, that you may have been misled by the newspapers into the belief that I should have something interesting to say regarding the work that lies before us in Princeton College. I have so recently said what was in me to say upon this subject that any elaborate address covering the same ground seems hardly called for. And yet, with that respect for the daily press which we insensibly come to feel, and with that conviction so hard to escape, that what the papers say must be true, I do not know that I can do better than acknowledge my obligations to my journalistic friends for

suggesting my theme, and attempt, at somewhat short notice, to do what they seem to expect of me.

The editor of one of our leading religious papers has asked me to give him an article on the future of Princeton, or the Princeton of the future; and I gave a hasty answer without thinking of the audacity of such an undertaking. How do I know what the future of Princeton will be? and what right have I to say what the future Princeton ought to be? Subject to correction, the correction that comes from experience, the correction that will come through the wisdom of colleagues who have had a much wider college experience than I have had, I think I may modestly admit that I have some ideas respecting the future development of our College. But the embodiment of these ideas, in actual college life, will depend very largely upon the contingency that these or similar ideas have likewise been in the minds of other men who are both able and willing to coöperate with me in their realization. It would seem, therefore, to be the part of wisdom to say little about the *Princeton of the future*, but to do with might and main what we can for the Princeton of the present. And yet I like the expression, the *Future Princeton*. I like it better than the *New Princeton*, for there is the faintest suggestion of revolution in the latter phrase; of willingness to cut adrift from the past, and to despise history. I like the forward gazing attitude that it implies. I do not say—far from it—“forget the things that are behind.” The things behind are part of us. They are our boast, our pride. But I do say, most earnestly, “reach forth to those things that are before.”

I like the element of expectation that lies in the phrase. It seems to say that something more is looked for than that we should go on as we have been going. We should not really be doing a small work if for the next ten years we kept on giving education

to 400 young men—if we gave a good education, if our methods were sound and our results were solid. But the public would be disappointed. The friends of the College would feel that we had been standing still. I tell you plainly that I do not mean to have the College stand still if I can help it.

I like the epoch-element in this phrase: *The Princeton of the Future*. You may think that there is no more reason why a change in the presidency of a great institution like this should be epoch-making, than that it should mark a crisis in a sea voyage, when one sailor relieves another at the wheel. But, for good or ill, such a change of administration cannot well be otherwise than epoch-making. For changes of method, of management, of plan, of arrangement, which have been foreseen as desirable, and which would in any event come one at a time, and perhaps at longer intervals, are somehow saved up for a new administration, and are very apt to come all at once. We cannot help this; it is one of the necessities of the situation that those who think change is desirable, will take the present opportunity for saying so. I confess I feel the influence of the thought that Princeton College has been quietly getting ready to step into a larger life, and that the talk about the university idea of which we hear so much, has beneath it a depth of sentiment that, in a very near future, must produce marked visible results in the development of Princeton. If I were not in full sympathy with this sentiment, I should not be here. For I have decided convictions with regard to the possibilities of Princeton, and with regard to what is necessary in the way of material resources in order that these possibilities may become actual.

When we think of the Princeton of the future, and anticipate the improvements that we hope are to come in the next decade, we are not simply nor even chiefly anticipating large additions from year to year to our Freshman Class, or the erection of a

new building now and then upon the campus, however desirable these may be. We are thinking of the opportunities that Princeton is to give for doing advanced work in all the departments of literary activity. An enthusiastic professor very naturally wishes to deal with advanced pupils. And if he happen to be interested in a department that promises rich results in the way of literary or scientific reputation, he is apt sometimes to grow impatient of the classroom drudgery, which is holding him back from the attainment of his end. Hence the young man, not because he knows more but because he has the enthusiasm of personal ambition, is very apt to have lofty conceptions in regard to the kind of work which a college ought to do. This is a most valuable element in our college life, and we can very well afford to foster it and give it weight in shaping the college ideals.

As I shall presently indicate, we have a more immediate work to do in strengthening and making more efficient the existing departments that contribute to the ordinary education leading to the Bachelor's degree; but I am in full sympathy with the idea that the great expansion of Princeton in the future must be determined with reference to the **post-graduate** courses of study—the studies that lead to the higher degrees.

The number of men pursuing these studies will be few, compared with those in the undergraduate department. But for the sake of the unity and continuity of our academic system, and in order that really the best results may be obtained in the ordinary academic curriculum, we should shape that curriculum with some regard to the needs of those who intend to prosecute the higher studies.

There is room for indefinite expansion in the post-graduate departments. There is no reason why we should not expect to have in Princeton a class of men engaged in advanced studies in Philology, Mathematics, Philosophy and Law, just as we have in our

sister institution a large class of men engaged in advanced studies in the department of Theology. There is no reason, save the lack of funds, why Princeton should not be famous for her School of Law as she is already famous for her School of Theology. And there is not only no reason against, but there is every reason in favor of the establishment of a **School of History and Political Science**, which would do work in both graduate and undergraduate lines of study.

The establishment of such a school by the endowment of two or three Professorships, would be, perhaps, the most attractive addition that could be made to our academic system. Such a school would, of course, offer a wide range of electives to students in the Undergraduate course, and would contribute a most important part—as the work of Drs. Sloane and Johnston is already contributing a most important part—to the education that leads to the Bachelor's degree; but it would, besides that, offer courses of study, and opportunities for original work, in preparation for the degree of Doctor of Philosophy. Our present scheme contemplates the giving of this degree to men who offer Political Philosophy as their chief study. Unless, therefore, we mean to be an Examining and not a Teaching University, which I am sure we do not mean to be, our scheme for the conferring of the higher degrees will call for more adequate provision for post-graduate instruction than we now have. But this cannot be accomplished without special endowments.

It is surely not unreasonable to hope, however, that a department so broad, practical, and intimately connected with our best interests as a nation, will sooner or later commend itself to the munificent impulses of some one who is seeking for a channel wherein to direct his benefactions with the most advantage. If this provision were made for our equipment, then, with the arrangements already made for us in

philosophy, and the addition from time to time of such help as may be needed in the ordinary academic department, we should be prepared to do advanced work along the whole line of the academic curriculum. We should be able to do this without prejudice to the work of undergraduate instruction, but rather to its advantage; and, with a large and increasing body of undergraduates from which to recruit our ranks in the higher graduate studies, we should have no difficulty in having a body of men in residence who would create an intellectual atmosphere that would be stimulating in the highest degree in its influence upon undergraduate life. To get the best results, however, we need Fellowships as well as Professorships. But with the good beginning that has been made in this direction, and the interest that our Alumni are taking in their Alma Mater, the increase of University Fellowships is, I think, not too much to hope for.

I do not think there need be any fear that zeal for graduate instruction will operate to the disadvantage of our ordinary academic course. The graduate courses, when they shall have been developed, will only be the expansion of work assigned to the undergraduate period, and wisely managed will, I am confident, react beneficially upon the undergraduate department. If however there is need of caution here, I am quite ready to say that our first and main function is to conduct the instruction of the departments that lead to the first degree. This is primarily what we are expected to do. It would be a perversion of trust to think of anything else. It may be more in accordance with our feelings and ambitions to do the higher work, and we may not enjoy the drudgery of making our commonplaces plain to men who find it hard to handle the conceptions with which we work. It is a great luxury to deal only with men who are interested in our departments, and with whom all elementary work may be

presupposed. But it is a luxury that we cannot indulge in and be faithful to the great trust that is reposed in us. It is at the beginning of the curriculum that we need the best teaching, and not at the end of it. Let us be careful then that our ideals do not so far transcend the actual conditions of our academic life as to unfit us for appreciating the needs of young men who, it may be, will never be philologists or philosophers, but who need the best instruction which the masters of the several departments can give them in the elements of these departments. And yet, as I have said already, if our system is to possess continuity, we must arrange our studies with some reference to the higher work, we must so adjust the curriculum of the undergraduate years as to have it lead up naturally to those studies which contemplate the higher degrees. This means that our schedule should be so arranged that, as a man approaches his senior year, he should be allowed to concentrate his attention, to a very considerable extent, upon the subject or subjects to which he wishes to give his life. By the time a man becomes a senior he should be able to give himself to ancient or modern literature, or to physical science in one or more of its departments, or to philosophy, or to political science, without being embarrassed by the necessity of prosecuting studies that are not germane to his life-work. I think it is pretty generally conceded that there are too many required studies in the senior year; and I know that, with regard to both the senior and junior schedules, there are professors who think that their departments should receive the attention of the students earlier than they now do. I do not think it will be possible, or even wise, to resist the claim that is made for an addition to the number of elective studies in the junior year. But, to meet this claim, it will be necessary to throw some of the junior departments down into sophomore year, as some senior departments should

probably go into the junior year; and that will involve a sacrifice of an hour or two, for a portion of the year at least, on the part of some of the departments now more than fully represented in the sophomore year. I foresee very clearly the difficulty that this involves. If we widen the range of electives in the Junior year we shall, probably, have smaller elective classes, and it will be hard for professors who have been teaching Greek and Latin to the best men of the class, to divide with the professors of Biology or History. And if the hours given to required Mathematics or Classics are to be shortened in the Sophomore year to make room say for Logic, we should be brought face to face with the necessity of making the *minimum* for the departments necessary for our degree a little less than it now is, and make up for it by introducing early in the course—say in the Freshman year—the distinction between Pass and Honor work, so that those who wish to do so and are fit for it, may pursue advanced studies from the beginning. We should, probably, succeed in making, of the few who would do the work, better scholars than we can make under our present system; and we should, in this way, make up for the slight loss that a department might suffer by the encroachment of other studies upon what has hitherto been its special domain.

The whole subject of **electives**—with which most of you are so much more familiar than I am that it seems almost immodest for me to speak of it so boldly in your presence—is one of admitted difficulty. Any plan that we may adopt will, I am sure, be the result of a very careful comparison of views and of many compromises of individual opinion in deference to prevailing desire and for the sake of securing the best results. So far, however, as I can now be said to have any fixed opinion upon the subject, I am sure that a few principles should govern us in regard to the arrange-

ments of the required and of the elective studies. We should certainly place those studies first that are presupposed in other departments. Thus, Logic, Psychology and Ethics would, without doubt, be regarded as the proper order of studies in Philosophy; so, I suppose, in other departments the genetic relations of the sciences would determine their order of precedence. Then, in the elective studies, I should say (1) that the group-system should in the main prevail. I do not think that a man is necessarily being educated because he selects fifteen hours a week out of a schedule of studies. There should be such a body of cognate studies in a student's group of electives that he can be fairly said to be giving his attention in the main to a department. This will have the disadvantage of cutting a man off from some studies that he would like to prosecute. And for those that are of sufficient magnitude to enter into the general equipment of life, I should be disposed to make a very liberal allowance; and I do not think that there ought to be much difficulty in discriminating between the relative values of electives, through the partiality of a professor for his department. A man should not be so blinded by prejudice in favor of his specialty as to be incapable of seeing that, however interesting to him and however essential to a complete acquaintance with a general group of studies his department may be, it is not intrinsically possessed of the general educational value which belongs to an elective taught by another professor. There ought not to be—though I dare say there will be—any great difficulty in discriminating between those electives which, because of their general importance, might be regarded as electives at large, and those which are fixed as members of a special group and system. (2) Then, in the next place, there should be a very firm stand taken at the outset that courses of lectures should not be allowed to rank as electives, and displace more serious and more difficult

studies, unless they are fair equivalents for the studies that they supersede.

If these general principles are kept in view, I think that, without suffering any loss of benefit which the old system of required studies secured, we may reap the full advantage that our new system now has, while allowing a wider range to the exercise of individual choice and the cultivation of special aptitudes. The general principle which now governs the college, according to which the studies of the Freshman and Sophomore years are required of all students, and which makes both Greek and Latin and Mathematics essential parts of the curriculum, is one upon which, I suppose, we are all agreed. The changes that will come are only the inevitable result of the expansion of the college and along the line of the conservative policy that has governed it heretofore. It is important, however, that when the matter is discussed in the committee of the Faculty, as well as in the Faculty itself, we may reach results upon the whole subject, both general enough and lasting enough to make it unnecessary to dislocate the entire schedule whenever a new department is introduced into the curriculum.

I shall show no lack of interest, I trust, in any of the departments of the College; and I shall not be so devoted to the interests pertaining to my own line of studies as to neglect the claims of those subjects with which I can be said to have only a very remote or even a slight acquaintance. At a suitable time, and as soon as practicable, I shall make an appeal for reinforcements in the department of Philosophy. It will be easy to show, when the time comes, our need of new strength in this most important branch of study if it is to keep the relative place it has had in this College in former years, and is to cope successfully with its powerful rival, Science, in that friendly competition for the suffrages of the student-body, which contributes so largely to the

enthusiasm of our academic work.

And so, though the department is one somewhat foreign to my own habits of thought, I shall be glad if the fine beginning that has been made in the department of *Æsthetic Philosophy* and *Archæology* shall be developed through the fostering influence of friends who will take it under their special patronage. It is a most important part of our College system and is most deserving of strong support.

But, in preference to personal preference or taste, our first business must be to supply the things most obviously lacking in our course of study. Through the appointment of Mr. Marion M. Miller, one of our recent graduates, as Instructor in English, we shall be able to give increased attention this year to this department. I can understand the desire that seems to be growing for more ample provision in our colleges for the study of English. We are apt to feel about the English language somewhat as Bagehot did about English literature when he said:

"For the English, after all, the best literature is the English. We understand the language; the manners are familiar to us; the scene at home; the associations our own. Of course, a man who has not read Homer is like a man who has not seen the ocean. There is a grand object of which he has no idea. But we cannot be always seeing the ocean. Its face is large; its smile is bright; the ever-sounding shore sounds o'er. Yet we have no property in them."

This is all very well; and I have no wish to say a word that is not in the direct line of promoting the interests of both the English language and English literature; yet I would take occasion to say to those who are drawn to these studies because they expect to devote their lives to pursuits that will require them to use their native language skilfully and with effect in written form, that they must not suppose that mastery of English literature will exempt them from

the necessity of study in other departments. It does not follow that we shall be able to write like Addison because we know Addison's style. We may know Milton, but we shall not have Milton's amplitude of vision unless we have some of Milton's learning. We may read Browning, but Browning's wealth of allusion comes out of his intimate acquaintance with history, his life under Italian skies, and his deep knowledge of the human heart, and not out of his knowledge of English literature. We can teach literature perhaps by simply knowing literature, but if we wish to make literature we must know something else. And I do not believe that the study of English will ever supersede, in the making of our English style, the study of Latin and Greek; just as I do not believe that the study of French and German can ever supersede the classic tongues for the purpose of general culture, necessary as the modern languages unquestionably are as tools to be used in the prosecution of any department of inquiry. And because they are necessary for this purpose, I think we should heed the call that comes to us from the side of both science and philosophy, that a more determined effort be made to give students a reading acquaintance with these languages before they reach the higher work of the Junior year. We should also place Latin on a level with Greek in the facilities for its study, and, as in the case of the latter, have three professors.

With these additions to our teaching force, and a permanent arrangement for the teaching of early English, and an additional Professorship in the department of Political Science, which is greatly needed, we might consider ourselves pretty fully equipped for the work of the undergraduate curriculum, besides having at our disposal the material for large additions to our post-graduate departments.

Let me revert to Mr. Miller so far as to say that we add his name to the long

list of which we feel so proud, and that represents most forcibly the position that our College is taking in the educational work of our land. I can not lay my hands upon the exact statements* that have recently been published in the newspapers; and it suffices for me to remind you of some of the professorial appointments that have fallen to the lot of Princeton Graduates during the past year: Mr. Armstrong in Philosophy at Wesleyan University; Mr. Baldwin in Philosophy at Lake Forest; Mr. Green in Philosophy at Miami; Mr. Woodrow Wilson in Political Science in Wesleyan; Mr. Boyd in Mathematics at Macalester; Mr. McNeil in Astronomy at Lake Forest; Mr. Warfield to the Presidency of Miami University; Mr. Guyot Cameron to the Chair of Modern Languages in Miami; Mr. McClumphe to the Instructorship in English in Bryn Mawr. This is not a complete list, but it illustrates the work that the College is doing, and is in itself a loud call for ample equipment for the great work of training men to fill important posts in the educational institutions of our land. There are difficulties in the way of our having technical professional schools in connection with Princeton College, though I do not think that question is so completely closed as many do; but there is nothing to prevent our doing at once treble the amount of work that we are now doing in preparing men to fill professorial positions.

Our friends must remember that it is a matter of most serious importance to our religious life as a people to have the Chairs of History and Biology and Physics and English filled by men who are imbued with the sound fundamental ideas that the world properly associates with a Princeton training. We must remember, too, that the time has gone by when any minister not successful as a preacher who, nevertheless, has kept up his reading in the Greek Testament, is thought the proper person to

* See page 13,

place in a Chair of Greek in a Western College. These new colleges are springing up all over the West—rapidly, and for the performance of a most essential function in the growth of civilization. The men sought for to fill the chairs in these institutions are young men—men of special ability and special attainment in the departments for which they are selected. We must remember, too, that Princeton holds a place in the esteem of the regions that foster these Colleges that will give her men especial advantages. It only remains that we so equip our departments that, through our Professorships and through our Fellowships, young men whose literary ambition will lead them into professorial work, may have opportunity for full equipment here, within the walls of our lecture rooms. And I would say to those young men who may be asking what profession they should choose; who have the ambition and the endurance necessary for doing really good work, that I do not know a more attractive field for the exercise of one's gifts, or one which offers such promise of the early fruit of literary toil as the profession of teaching. Both in the sphere of college and school work, there is a growing demand for high class men, and a growing appreciation of their place in the literary world.

A change of administration is very naturally a time of anxiety in the management of a college, and the friends of Princeton, I have no doubt, have had a little solicitude with regard to the prospects of the College for the present year. It would not have surprised us if there had been some falling off in the number of entering students as compared with last year. But we are gratified to know that there is now no reason for anticipating such a falling off. We could increase our numbers every year, I have no doubt, if we took more particular pains to bring the claims of the College before the young men who desire a college education. College management, in this country at least, must con-

form to some extent to the methods of the business world. And one of these is to carry our wares to the doors of those whom we expect to buy. It has been of great advantage to us this year that we have extended the system of local examinations. The good results that have followed will encourage us, I am sure, to make a more systematic endeavor in this direction next year. Our friends could do no better service for us, however, than in the establishment of schools in the localities where they have influence, which will at least take care that nothing unfavorable to Princeton be allowed to operate upon the minds of pupils. While I speak of this, I may say that we have reason to express our obligation to our Chicago Alumni for the great interest they have manifested in the establishment of the University School in Chicago, which is under the very efficient direction of one of our recent graduates. Mr. Coulter, who is opening his school this month under what seem to be the most promising auspices. And while I am on this general subject, I may be allowed to say that there is nothing that appeals to me with more interest than the case of young men (and there are a few every year) of rare gifts, earnest purpose, belonging to the intellectual *élite* of the College—who write that for lack of funds they must relinquish their studies or go to colleges that are able to offer them the pecuniary aid necessary for meeting their expenses. We can remit tuition, but, of course, we cannot pay a man's bills. I am sure that there are men, if I only knew who they were, (other than those who are already burdened by their interest in the College, and to whom it would be unseemly for me to go,) who, if they knew the circumstances to which I refer, would give me leave to ask them for special help in behalf of those who are specially deserving.

I must repeat what I have said so recently regarding the importance of our Scholarship Fund. This fund is the most direct contri-

bution that can be made to the current expenses of the College; it does not go into the student's pocket, but is used to pay his tuition bills, and helps in this way to meet the current expenses attending the management of the College. We are determined not to turn a man away because he cannot pay his tuition fees; but it is clear that this generous policy will be increasingly to the cost of the College unless it is offset by the increase of our scholarships. There are now seventy-two* of these reported in our catalogue. This number, I am sure, will be increased this year, but how much I cannot say. I hope, however, that we may be able to report a hundred of these scholarships in the spring. I am making a pretty large bill of particulars, I fear, but I have mentioned nothing as yet that is not imperatively demanded by the existing needs of the College. The public has persuaded itself that Princeton is in no need of money, until I begin to fear that even the friends of Princeton have come to entertain the same idea. It is for the friends of sound Christian education to say whether they wish to see Princeton stop in her career of progress, or whether they wish to see her go ahead. If we are to go on and keep pace with the advance of ideas in the higher education, we need money, and a great deal of it. We need it for all the uses that I have named, but we need it also for a new dormitory. Our students are out-of-doors. They come up here and are kept a whole year waiting for a room in "Witherspoon," or "East" or "West." This ought not to be so. To be sure, they are kindly cared for by our citizens, but I am told that we are approaching the limits of the town's ability to absorb our surplus. And we must have a new dormitory this year. I do not hesitate to say, knowing, as I think I do, the wants of the College pretty well, that the very best benefaction to Princeton College that could be

made would be a new dormitory worthy of the commanding site that is waiting for it.†

I am happy to greet the students of the College who return to take up the work that was interrupted by the summer months. The schedule of studies you will find unchanged, and the work of the year will go on regularly and I trust profitably. Not entire strangers to one another, I nevertheless hope to become better acquainted. I shall seek to know you as well as the infirmities of uncertain sense-perceptions will let me; and as it is easier for a hundred to know one than for one to know a hundred, you will do me a great favor if you will help me to recognize you as I should when I meet you. I wish you great success in your work, and should be pleased to know if I can be of service to you in any way; and shall be happy to see those who call upon me at the Faculty Room any afternoon at four o'clock, or at my house at any time.

Let me say the same to those who enter College for the first time; and let me add that the Class of '92 will always be associated in my mind with special interest, inasmuch as their college career, so to speak, begins contemporaneously with my own.

You will grow more in the next four years, in all probability, than in any succeeding four of your earthly life. You cannot be too seriously impressed with the idea that you are at one of the turning points in life. It is the time for your manhood to show itself in your choice of friends, in your habits and in the formation of your plans. You would do well to begin with the idea that you came here to get an education, and that the more you apply yourself to that, the better it will be for you in the long run. You can enjoy life in a safe way and secure the benefits of companionship which constitute no small part of education, without indulging in idleness, or allowing your good-nature to rob you of the time

* There are seventy-seven now.

† The money has been given by Mrs. Brown.

that belongs to your studies. You will learn to think on practical questions, and you will have enough of them this year, particularly, to give you something to talk about; but pardon me for saying that it is more important to society that you should get the discipline of a good education, than that, at the present stage of your career, you should have dogmatic convictions regarding the Presidential Campaign.

Your studies will widen your range of thinking; and your thinking, if you are serious, will sooner or later grapple with fundamental questions that underlie our religious hopes. Let me counsel you to be steadfast in the religious faith wherein you have been trained, and conscientious in the discharge of your religious duties. If you reach the point where you feel that your religious convictions need the reinforcement of argument, you need not be at a loss. The investigation of fundamental problems in religion is serious work however, and if you suppose that you can shorten the process by reading theological novels like John Ward and Robert Elsmere, you will only join the shallow multitude who think that ignorant unbelief is an improvement upon traditional faith.

Men have become famous in professional careers who spent their college days in idleness. Do not imitate their idleness, for you may not be able to duplicate their success.

It remains with you to say what your college career will do for you; but it is in your power to make it the unspeakable blessing of your life that your steps were turned hither. That it may be so, and that in some humble way I may help to make it so, is my earnest hope and prayer.

TWO PROJECTS FOR UNIVERSITY AND SCHOOL EXTENSION.

Within the past few weeks two important schemes have been brought forward for the purpose of extending some of the advantages

of a school and college education to those who have not been able to enjoy them. They are similar in plan, as well as in purpose, and are, in fact, adaptations of the well-known system employed in England by both Oxford and Cambridge. Both schemes have enlisted eminent men in the ranks of their supporters.

The first project is patronized by Harvard and Yale Universities, and by Princeton and Columbia Colleges, and is presided over, for the present year, by President Dwight, of Yale. It is divided into two sections: (1) University extension, and (2) School extension. The faculty of the University Extension consists of:

President—Prof. Timothy Dwight, President of Yale.

English Literature—Prof. F. J. Child, Harvard.

Geology—Prof. N. S. Shaler, Harvard.

History—Prof. S. M. Macrane, Harvard.

English Language—G. L. Kittredge, Harvard.

Psychology—Prof. Geo. T. Ladd, Yale.

Latin—Prof. Tracy Peck, Yale.

Mathematics—Prof. A. W. Phillips, Yale.

Chemistry—Prof. Wm. G. Mixter, Yale.

Astronomy—Prof. C. A. Young, Princeton.

Physics—Prof. C. F. Brackett, Princeton.

Greek—Prof. S. S. Orris, Princeton.

Geol. and Paleont.—Prof. J. S. Newberry, Columbia.

German Lit.—Prof. H. H. Boyesen, Columbia.

The plan is thus outlined. In the modern and the classic languages and literatures, and in the arts and the sciences, courses for reading, observation, experiment, discussion, and study in family and in other social circles, are outlined by the university professors in their respective departments.

Students will be encouraged and assisted to form themselves into circles for reading and discussion, and, in places where the membership will warrant, short courses of lessons and lectures will be given by university professors and others, and written examinations held for those who present themselves for this purpose.

The examinations will be conducted by local secretaries in April or May of each

year. The question papers will be prepared by members of the Faculty of the University Extension in their respective subjects, and the answers marked under their direction. Certificates will be granted to successful students.

Courses will be offered for the two years beginning Dec. 1, 1888, and ending May 1, 1889, in the *English, French, German, Latin, and Greek languages and literatures*, in the *natural* (geology, botany and zoölogy), the *physical* (chemistry, physics, phys. geography and astronomy), the *social* (psychology, history and political science), and *mathematical* (algebra, geometry, trigonometry, anal. geometry and elements of calculus) *sciences*.

For School Extension the circular announces: "In the subjects taught in the public schools and in the methods of instruction in these studies, courses for teachers will be outlined by different superintendents, principals, professors in normal schools, and specialists, forming the Faculty of the School Extension. In each of these subjects there will be two courses, one for the study of the subject itself, and one for the study of the methods involved in teaching the subject.

It is also announced that arrangements may be made with Summer Schools with practical courses, for two or three weeks. The membership fee is \$1; and a fee of \$1 is required for each course of study, and for each examination.

The second scheme is under the patronage of the large and popular Chautauqua Institute, and is called the "Chautauqua University Extension." Its central committee is headed by Dr. Vincent, the Chancellor of Chautauqua University, and includes Professors Adams and Ely of Johns Hopkins University, and Professor W. R. Harper, of Yale University. Its general committee consists of responsible heads of

departments of instruction, including professors in a number of the colleges and universities of the Western and Central States. These heads of departments select and recommend to the Central Committee the lecturers who supply the demand for courses of lectures in various subjects from circles in cities and towns all through the country. It is termed "A revival in the United States of the original idea of a University as a voluntary association of Students and itinerant Lecturers."

The lecturers are to be young specialists, recent college graduates, and the courses are to consist of twelve weekly lectures, at the end of which an examination is held by which "pass certificates" are granted. "Any town or city which is prepared to furnish an audience of 200 or 250 people and a hall, can secure, by a guarantee fund of \$350, a course of lectures on any given subject. The work will begin in the fall of 1889, and continue through the winter and spring, being merged, in the summer, in the College of Liberal Arts at Chautauqua.

In support of the scheme, its success in England, since 1872, when it was started by Cambridge, is pointed out. In the session of 1886-7, over 10,000 students attended the lectures at about fifty-five centres, under the auspices of Cambridge. Oxford has been of late no less successful, and other institutions like the University of Durham, Owens' College, Manchester, and the "London Society for the Extension of University Teaching," established last winter.

The sudden and contemporary presentation of these two schemes in America is doubtless due to the delegation of graduate students from Oxford, Cambridge, Edinburgh and Glasgow, who visited our country during the past summer and popularized the English system.

LIST OF GRADUATES OF PRINCETON COLLEGE WHO HAVE RECENTLY
RECEIVED APPOINTMENTS.

Name.	Class.	Position.	College.
J. Mark Baldwin, Ph. D.,	'84,	Prof. of Philosophy,	Lake Forest University.
Malcolm McNeil, Ph. D.,	'77,	Prof. of Astr. and Math.,	" " "
A. Campbell Armstrong, Ph. D.,	'81,	Prof. of Philosophy,	Wesleyan University.
T. Woodrow Wilson, Ph. D.,	'79,	Prof. of Hist. and Pol. Science,	" "
Ethelbert D. Warfield, M. A.,	'82,	President,	Miami University.
Wm. Brenton Greene, M. A.,	'76,	*Prof. Mental and Moral Phil.,	" "
John Grier Hibben, M. A.,	'82,	*Prof. " " " "	" "
Arnold Guyot Cameron, M. A.,	'86,	Prof. Modern Languages,	" "
Thomas M. Parrott, B. A.,	'88,	Principal Preparatory Dep't,	" "
Roger B. C. Johnson, B. A.,	'87,	Prof. Mental and Moral Phil.,	" "
Horace N. Mateer, M. D.,	'77,	Professor of Biology,	Wooster University.
Henry Crew, Ph. D.,	'82,	Professor of Physics,	Haverford College.
James H. Boyd, M. A.,	'86,	Prof. Mathematics,	Macalester College.
Arthur T. Kimball, Ph. D.,	'81,	Asst. Prof. Physics,	Johns Hopkins University.
J. Leverett Moore, A. M.,	'81,	Asst. Prof. Latin,	" " "
Richard J. Hall, M. D.,	'75,	Prof. Anatomy,	Columbia College.
Robert W. Hall, M. A.,	'73,	Prof. Chemistry,	Univ. of the City of N. Y.
Wm. L. Rogers, M. S.,	'84,	Prof. Natural Sciences,	Occidental College, Cal.
Taylor Reed, M. A.,	'86,	Asst. Prof. Astronomy,	College of New Jersey.
Henry D. Thompson, B. A.,	'85,	Tutor in Mathematics,	" "
Leroy W. McCay, D. Sc.,	'78,	Asst. Prof. An. Chem. and Min.,	" "
Marion M. Miller, M. A.,	'86,	Instructor in English,	" "
Alexander H. Phillips, M. S.,	'87,	Assistant in Biology,	" "
Wm. A. Robinson, M. A.,	'81,	Professor of Greek,	Lehigh University.
Pennington Ranney, M. A.,	'82,	Professor of Chemistry,	Rutgers College.
George P. Pierson, M. A.,	'82,	Professor,	Union College, Tokio, Japan.
Henry M. Landis, M. A.,	'83,	Professor,	" " " "
Rev. Richard D. Harlan, M. A.,	'81,	President,	N. Y. College of Music.
Wm. T. Henderson, M. A.,	'76,	Lecturer on Hist. of Music,	" " " "
Charles F. McClumpha, M. A., Ph. D.,	'85,	Instructor of English,	Bryn Mawr.
M. Allen Starr, M. D., Ph. D.,	'76,	Prof. Nervous Diseases,	Columbia College.
Frank Hartley, M. D.,	'77,	Lecturer on Surgery,	" "
A. Chase Palmer, Ph. D.,	'78,	Asst. Prof. Chemistry,	Tufts College.
John DeWitt, D. D.,	'61,	Prof. Apologetics,	McCormick Theol. Seminary.
A. C. Zenos, D. D.,	'80,	Prof. N. T. Greek,	Hartford Theol. Seminary.
James J. Robinson,	'84,	Prof. Ancient Languages,	Univ. of Montana.

*Declined.

*THE CLASS OF 1877 BIOLOGICAL
LABORATORY.*

The College had long felt the want of a laboratory for instruction in Vertebrate Anatomy and Embryology. The rooms for the courses in Botany and Invertebrate Zoölogy in the School of Science Building, are large and well equipped for these branches of Biology, but they could not be extended for the special work in Vertebrate Morphology, Embryology and Histology, which were added to the Academic and School of Science Elective Courses in 1880. Between 1881 and 1888, all these courses were conducted in an old dwelling-house adjoining the School of Science, and in the upper floor of the west wing of North College. During this period three appointments to professorships in different branches of Biology were made from the Class of 1877, and the Class naturally acquired an especial interest in the progress of this department.

At the '77 Decennial Reunion, the proposal of the Executive Committee to present a Biological Laboratory to the College was accepted, and the plans for the building, kindly presented by A. Page Brown, archt. of New York, were approved. The contract was at once awarded to Cubberly & Kafer, builders, of Trenton, but, owing to the delay in procuring the brick and terracotta work from the Perth Amboy Company, the building was not completed until June 15th, 1888. The Laboratory was opened for instruction in September, and was formally presented to the College in the following memorial:

COLLEGE OF NEW JERSEY, OCT. 8TH, 1888.

To the Honorable the Board of Trustees of Princeton College:

We, the undersigned, the Executive Committee of the Class of '77, acting on behalf of the Class, desire to formally present to Princeton College, "The Class of 1877 Biological Laboratory." The building has been erected and furnished at a cost of twelve thousand dollars, and is free from debt. The three laboratories and basement are now provided with cases, working tables, water and

gas fixtures, fully adequate for the present requirements of instruction. We request that the building be hereafter considered the property of the College for the uses and purposes of a Laboratory, subject to the right of the Class to hold its reunions therein, and that the Class be relieved of all further expense in the matter of equipment and repair.

We respectfully further request the appointment of three members of the Class as a Permanent Committee to act in consultation with the Committee on Grounds and Buildings of your Board, in the general supervision of the Laboratory.

(Signed)

JOHN A. CAMPBELL,

President and Treasurer,

and five others.

The following reply was received, taken from the Minutes of the Board of Trustees:

Resolved—That the gift of the "Biological Laboratory" from the Class of 1877 be accepted with the thanks of this Board; and that so much of the communication of the Executive Committee of the Class as relates to the Appointment of a Class Committee of three to act in consultation with the Committee on Grounds and Buildings be referred to the latter Committee.

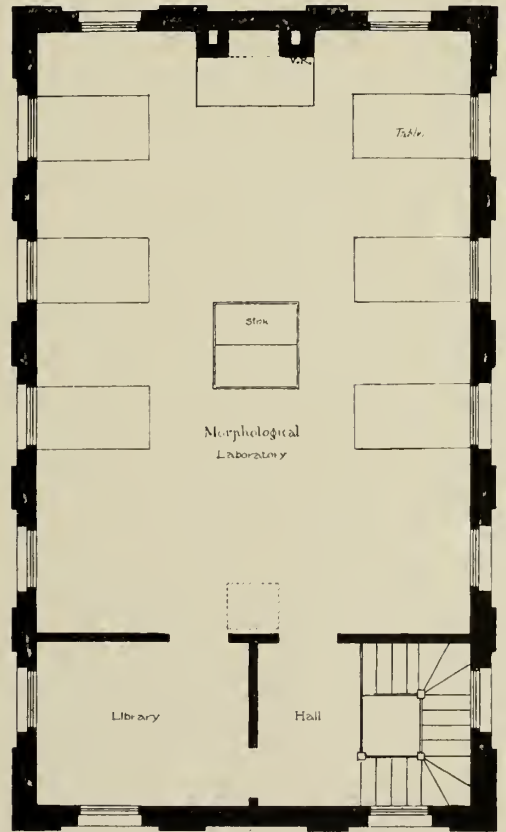
(Signed)

E. R. CRAVEN, Secretary.

As shown in the accompanying plate, the building is in the Romanesque style, and was designed with the double object of offering an attractive exterior and an interior with abundance of light and space for purposes of Laboratory instruction. The exterior finish is in the Perth Amboy speckled brick, with terracotta mouldings and arches, and sandstone window sills. The roof is finished with dark Spanish tiling. Over the main entrance is an elaborate tablet with the motto and inscription of the Class. The interior arrangement is for the accommodation of undergraduate elective classes in the elementary courses in Vertebrate Anatomy, Embryology and Physiological Psychology, with separate rooms for graduate students in these branches. The main, Morphological Laboratory upon the second floor, is for the former. The large working tables, for four students each, are placed at right angles to the windows, and thus



Ground Plan
Biological Laboratory



Second Floor Plan
Biological Laboratory

THE CLASS OF 1877 BIOLOGICAL LABORATORY.

adapted both for dissection and microscopic work. In the centre of the room are the water-fixtures and demonstration tables. The end wall spaces are fitted with instrument and reagent cases, and between the windows are hung diagrams and charts. The present maximum accommodation is for thirty-two students working at once. Opening into the Laboratory is the Library, provided with all the general works which are readily accessible, and also special works borrowed from the College Library, in connection with certain courses. The Embryological Laboratory, on the first floor, is equipped for University students who are pursuing advanced courses, or engaged in original research. It is in charge of the Class of '77 University Fellow in Biology. The Physiological Laboratory is designed for experimental work in Psycho-Physics, but has not as yet been fully furnished. The basement is provided with aquaria.

ORIGINAL CONTRIBUTIONS.

DR. McCOSH'S FORTHCOMING VOLUME.

Doctor McCosh has in the press a volume of 250 pages on **FIRST AND FUNDAMENTAL TRUTHS**. Every body speaks of certain truths which are seen to be truths at once; they need no proof, they cannot be made more certain by mediate evidence. Such for instance are the axioms of Euclid and our own existence. There is a body of such truths, and Dr. McCosh has undertaken the bold and difficult work of enquiring into their nature, unfolding and expressing them. He believes that as Aristotle has determined, in his logic, the laws of discursive thought, so it is possible in metaphysics to ascertain the nature and the laws of primitive or fundamental thought. He has enumerated and classified these primary truths, and examined them carefully under the head of Cognitions, Beliefs, and Judgments. He has given the tests

by which they are easily distinguished from all other and derivative truths; they are Self-Evidence, Necessity and Catholicity. He shows that these first principles, as intellectual and moral, are involved in the practical affairs of life, and in all the sciences, even the physical. In conducting this investigation, he avoids scepticism on the one hand, and idealism on the other. He separates himself from that English School which, following Hume and John S. Mill, deny that there is any fundamental truth, and from the German School of Kant, who maintain that we know things only under forms imposed by the mind, a doctrine which has led to a more formidable scepticism than that of Hume. In doing this, he is seeking to establish a Realistic Philosophy which he says ought to be the special American Philosophy. He is at present expounding these views to an advanced class of 70 Seniors and Post Graduates. The work will be published in February, and will constitute the cope-stone of Doctor McCosh's philosophic works.

THE INTRODUCTION OF GOTHIC ARCHITECTURE INTO ITALY.

By A. L. FROTHINGHAM, Jr.

There are two opinions held by historians of architecture as to Italian Gothic: in the eyes of the admirer of Northern Gothic, it has no merits: is an anomaly without a particle of the true Gothic spirit; for others, it possesses the great artistic merits, but all are agreed that the principles of Northern Gothic architecture were never introduced or naturalized in Italy. A German architect built the first great Gothic church in Italy, San Francesco at Assisi, begun in 1228, finished in 1253. Germans were doubtless to be found through Northern Italy in the thirteenth century, as their influence is perceptible in the Gothic of Bologna, Milan, etc. This paper is to announce what will

soon be proved by a series of illustrated papers. (1) That Northern Gothic was introduced into Italy before the end of the XII century, thirty or forty years before San Francesco of Assisi was built. (2) That it came from France, not from Germany. (3) That it was introduced by the Cistercian monks sent by St. Bernard. (4) That this transitional Gothic style was imitated by Italian architects in a group of buildings erected between 1200 and 1260. (5) That the Franciscan and Dominican orders, in at once adopting the Gothic style as their own and spreading it throughout Italy, did so under the influence of the Cistercians.

The most important new facts proved are that the form of early or transitional Gothic was known in Italy almost as soon as it was developed in France, and that its introduction was earlier by over a quarter of a century than has been hitherto believed.

The centre of this style is in the province of Rome. That the discovery had not been made before is due to the fact that most of the buildings in question are early and now deserted monasteries situated in the country far from any centres of population. I visited in 1880 the former Cistercian monastery of Casamari, not far from Frosinone, on the line of railroad from Rome to Naples, before reaching Monte-Cassino. I was struck to find that the church, cloisters, chapter-house, refectory and monastic buildings were all built in a pure early Gothic style that reminded me of France. I found that the church was begun in 1203 and finished in 1217, and that some of the other constructions of the monastery were earlier. Some time afterward I found that another and a sister monastery called Fossanuova, was still standing further to the east, near Piperno.

I had photographs taken of both series of buildings, and found that those at Fossanuova must, from their style, slightly antedate those at Casamari. This was confirmed by a study of the ancient Fossanuova

Chronicle, which made it clear that the church, begun c. 1190, was finished in 1208. Its unribbed cross-vaults indicated about that amount of superior age to the rib-vaults of Casamari. Still earlier than the church were the refectory and the hospital, whose date may be placed between 1160 and 1190, while the chapter-house may be a little later than the church. The workmanship in these buildings shows not only French direction but actual French handiwork; they are the originals, the models, erected by the artists come from Burgundy. At Casamari, although dimensions, plan, details are all the same as at Fossanuova, proving that the work was directed by a French architect, probably the same who erected the earlier monastery, yet the carelessness of the details, and the introduction of discordant decorative elements of classic origin, are sufficient to show that we are a step further off from the original style—that the workmanship is here Italian.

A study of the buildings of this and other regions shows not only that this new architecture was adopted and adapted in the buildings erected by the Cistercian order, but that the use of it spread to cathedral and parish churches. In this process it is interesting to observe the Italian inability to appreciate the especial beauties of Gothic architecture. The style is not developed from the point at which it was when introduced from France; on the contrary, it was inharmoniously modified to suit national tastes to such a degree that the origin of the style is finally almost lost sight of. The following is a first and necessarily incomplete table of filiation of these monuments:

Valvisciola,	Fossanuova.	Casamari.
	Viterbo: S. Martino.	Alatri:
		S. Maria Maggiore.
		Ferentino:
		S. Maria Maggiore.
		Cathedral.

Some of the characteristics of this early Cistercian style—the square apse with its square side-chapels; the simplicity of decoration; the floral capitals—were borrowed by the Franciscans and Dominicans.

These orders, on their rise at the beginning of the XIII century, adopted the Gothic style and were the chief agents for its spread throughout Italy. It is interesting to find that their inspiring source was French and not German.

By sending a photographer to the various localities, I have secured quite a large series of photographs of all the buildings with which I am acquainted which belong to this Cistercian style, pure or derived. These I expect soon to publish together with drawings, to illustrate some papers on Early Gothic in Italy, in which I shall give whatever can be gathered regarding the history of these monuments. To do this, a thorough study of Cistercian architecture throughout Europe is necessary, for this peculiar style, with its strongly-marked characteristics, is found not only in Burgundy, where it originated, but throughout France, Great Britain, Germany, Italy, Belgium, and Spain.

NOTES ON TERENCE.

By ANDREW F. WEST,
PROFESSOR OF LATIN AND PEDAGOGICS.

I.

An edition of the *Andria* and *Heauton timorumenos*, with an introduction and literary and textual notes, prepared by me for the Harpers, was issued by them in the middle of September. The use of the book in the class-room has disclosed typographical errors, mostly matters of orthography, which are here indicated for the benefit of students:

—Pp. xx, *κοιλον*, in the cut of theatre, should be *κοῖλον*.

xxvi, l. 5, *delectaverit* should be *delectauerit*.

4: l. 20, *neglegentiam* should be *neclegentiam*.

6: l. 71, *neglegentia* should be *neclegentia*.

7: l. 92, *exemplum* should be *exémplum*.

9:137, prefix *SO.* to *quid ais?*

9:153, for *cum* read *quom*.

9:155, comma for period at end of line.

12:204, strike out period at end of line.

18:306, put comma for period after *Ah*.

20:331, put period at end of line.

23:376, for *suscenseat* read *succenseat*.

24:397, for *neglegentem* read *neclegentem*.

25:424, for *me* read *ne*.

31:512, for *primus* read *primum*.

31:517, for *cum* read *quom*.

36:617, for *impeditum* read *inpeditum*.

36:619, for *impeditam* read *inpeditam*.

42:699, comma for period at end of line.

48:823, for *cum* read *quom*.

55:944, for *quom ego* read *quóm ego*.

71:185, for *inuitatem* read *inuitatum*.

75:239, strike out one *mores*.

128, note on l. 5, for *Utor* read *Vtor*.

129, “ “ 11, 12, for *levi* read *leui*.

129, “ “ 14, for *vidisse* read *uidisse*.

134, “ “ 68, put a bracket after (*De Am.* 24.

138, line 11, strike out “any.”

155, note on 302, for *e Davo* read *e Dauo*.

165, next to last line, for “has” read “had.”

173, note on 602, strike out *ad*.

175, “ “ 617, for *inpedite* read *inpedire*.

192, note on 883–885, for *miseram me* read *me miserum*.

207, under “Personae,” for *Pamlus* read *Pamphilus*.

214, note on 78, for “informed” read “inquiring.”

218, line 1, insert *apud* before *me eritis*.

219, line 1, for “and is” read “and are.”

241, opening note at end, insert “the” before “iambic.”

II.

Umpfenbach's collations of the text of Terence, from manuscripts, scholia on the

Codex Bezae Cantabrigiae and the ancient commentators, seem destined to remain for a long time the unquestioned *novae editionis parandae fundamentum*, as Dziatzko puts it. The very great difficulty of obtaining perfect typographical accuracy in printing a *variorum* edition is evident. Umpfenbach's own witness to this is his nine pages of *Addenda et Corrigenda*. In the "sacred cause of typographical accuracy" it will not be out of place to indicate some additional *corrigenda*. First, under the table of *Addenda et Corrigenda* comes a note on *And.* I., l. 128, *lege ducere pro ducere*. This is meaningless and unnecessary, for *ducere* with verse-accent appears accurately in the text. The others are chiefly metrical:

I. *The Andria*:

p. 31, l. 330 needs period at end of line.

48:583, for *dolis* read *dolīs*.

49:587, for *grátia* read *grátia*.

50:600, for *in* read *in*.

51:611, for *hoc* read *hóc*.

51:615, for *producam* read *producám*.

53:625, for *memorable* read *memorábile*.

53:630, for *Dénegando* read *Dénegandó*.

54:635, the whole line needs its accenting revised.

54:647, for *tibi* read *tibi*.

58:703, for *quid* read *quíd*.

61:738, for *uides* read *uides*.

64:789, for *Nouí* read *Noui*.

78:944, for *cum* read *cúm*.

79:954, for *Quíd* read *Quid*.

81:977, for *atque* read *atque*.

81:978, for *apud* read *ápud*.

85:15, for *fúi* read *fúi*.

II. *The Heauton timorumenos*:

187:8, for *cuia* read *cuía*.

188:25, for *uestra* read *uēstra*.

188:32, for *cur* read *cúr*.

189:49, for *indux i* read *induxí*.

197, heading to Sc. 2, for CLITIPO read CLITIPHO.

198:185, for *nóbiscum* read *nóbiscum*.

201:221, for *tibi* read *tibi*.

202:227 (15), for *Meast* read *Meást*.

204:241, for *tibi* read *tibi*.

219:461, for *hábuít* read *hábuít*.

230:618, for *míhi* read *míhi*.

III.

The paper of Professor Pease, of Bowdoin, entitled *On the Relative Value of the MSS. of Terence*, published in the last volume (No. XVIII) of the Transactions of the American Philological Association is of marked interest. "All the variations from the accepted text of Umpfenbach" have been assorted by Professor Pease for most of the plays into suitable categories with the result of showing, as it seems to us beyond question, that the *Codex Parisinus* marked P), and the whole "P family" (including PCB), have been undervalued, and deserve to rank next after the Bezae Codex (A). Professor Pease conducts a full statistical inquiry, examining first the variations in Umpfenbach from the original readings in the MSS. in respect to omissions, insertions, substitutions, inversions, corruptions, inflexional variations, interchange of rôles and variations in spelling. His second inquiry deals not with the original readings but with the correctors' alterations. His third inquiry relates to the history and present state of critical opinion as to the relationship of the families of manuscripts, and leads to the result that the triple division is to be adhered to, leaving A the place of first excellence, but making the nucleus of the second group PCB, and of the third DG.

BOOK REVIEWS.

THE ANDRIA AND HEAUTON TIMORUMENOS OF TERENCE. Edited with an Introduction and notes, by ANDREW F. WEST, Ph. D. Giger Professor of Latin in Princeton College. 12 mo., cloth. (Harper's New Classical Series). Harper & Bros. New York, 1888.

The importance of Terence in the college curriculum not only from the linguistic and literary standpoint, as marking an era in the development of the Latin language and of Roman culture, but also and more especially as presenting a living picture of the life of the ancients through the medium of the actual speech of the people, is too obvious and too well established to need argument. While encomiums of the work of one of our own body would be out of place in this publication, there is no impropriety in our showing what was the editor's purpose and the means chosen to accomplish it.

Dr. West's edition of these two plays is the direct result of several years experience in reading Terence with underclassmen. It is safe to say that no one knows as well as the teacher who uses it what is needed in a text-book. Hence we have a right to look for an eminently practical book, and it is evident that the editor has aimed supremely at this quality. The questions of text criticism are neither important nor interesting to students in their early undergraduate days. Accordingly, this subject is disposed of in brief textual notes at the end of the volume.

More than one classical text for young students, lately published, has been overloaded with a mass of commentary, more or less erudite, intended, apparently, to display the learning of the editor. Our experience of such notes is that the average student makes no use of them. Notes should give the student just the help he needs for a clear understanding of the text, enough help to tempt his continual reference to them, but should not try to tell him all that can be said in the connection, or seek to paralyze the energy of the instructor by leaving nothing for him to say. The notes under consideration do not err in this direction. Throughout, the editor has kept in view the fact that the text is a play, and he has tried to bring out with prominent emphasis all the points of dramatic

significance. This is a matter for special attention.

The introduction is a prominent feature of the work. Here again we notice the same eminently practical purpose, the endeavor to present clearly and simply to the student the essential facts relating to the native beginning of Roman comedy and its subsequent development under strong Greek influence. The history of the Attic comedy, of which the Roman was a logical successor and without a knowledge of which it is unintelligible as a literary product, is briefly discussed. Terence's Roman predecessors and then Terence himself, are successively treated. Then follow, after an explanation of the Roman theatre and of the public games, which were the special occasions of dramatic performances, a general description of the author's *dramatis personae* and his plots, and a short discussion of the division of the plays into acts and scenes. The distinctive features of the language and style of Terence, and his position, significance and influence in the history of Latin literature form the subject of remarks which aim to give, not extensive information, but a sharp conception of the salient points of the matters discussed.

Finally, we come to what is perhaps the most valuable and certainly the most needed portion of the whole work, the explanation of the metres. One too often reads Terence as so much prose, losing sight of the dramatic significance of the metres and of their changes as the situations require, and so misses some of the finest touches of the dramatist's consummate literary workmanship, and misses also his whole vast revelation of the character of the spoken language of the Romans of the 2nd century B.C. The illustration of Latin metres by analogous examples from familiar English verse, falls into line with the already emphasized vitality and practicality of the book. The introduction ends with a few words upon the history of the preservation of the text of the comedies.

The archaic orthography is used and the verse accents carefully indicated throughout the text. Convenient metrical indices follow the notes. We notice in particular the suggestion, page 176, foot note, of a scansion for *Andria* 635, a line which has hitherto been a puzzle; and, page 257, the textual note on *Heaut. tim.* 232, in which the reading of the Mss. is defended against Bentley's attack. J. H. WESTCOTT.

A COMPARISON OF THE AMERICAN AND EUROPEAN TERTIARY MAMMALIA.

W. B. SCOTT,

PROFESSOR OF GEOLOGY.

An examination of the chief palæontological collections of Europe, including those at London, Paris, Munich, Vienna and Florence, has led me to some unexpected results with regard to the relations between the tertiary mammalian faunas of Europe and North America. The principal impression made by the comparison is one of *dissimilarity*, correspondences being the exception. The present likeness between the mammals of the Palearctic and Nearctic regions is of comparatively recent origin, for throughout the eocene and miocene periods the differences were greater than they are now. Whole families are confined to one side or other of the ocean, and even when families occur on both sides, they are nearly always represented by different genera; the number of identical genera is even less than has been commonly supposed.

The Perissodactyla are the most generally distributed of the tertiary forms, and when the genera of this group are not identical in the two regions, they are for the most part closely allied. *Tapirus* is common to the two continents, and several tapiroids are nearly but not quite identical. Of the rhinoceros line, *Aceratherium*, *Diceratherium*, and probably *Aphelops*, occur in both regions. M. Filhol showed me some undoubted specimens of *Hyrachyus*. *Hya-*

codon has not yet been found in Europe. The members of the horse-line are distributed in a remarkably curious fashion. *Hyracotherium* and *Pliolophus* occur in the eocene of both regions, but here identity ceases. *Anchilophus* differs from *Ephippus*, *Anchitherium* from *Meshippus*, and *Hipparion* from *Protohippus*, though in each case the differences are comparatively unimportant. America has no member of the *Palæotheriidae*, while the great group of the *Menodontidae*, including *Menodus*, *Diplacodon*, *Palæosyops*, *Leurocephalus*, &c., &c., are, so far as is yet known, entirely confined to it. That most extraordinary creature, *Chalicotherium*, ranged over the whole northern hemisphere. But while this similarity is obvious and real, America is none the less preëminently the land of perissodactyls; the number both of species and individuals is far greater here.

In the Artiodactyla the differences are far more radical and all in favor of the Old World. In America this group is but scantily represented throughout the eocene, and though numerous in the miocene, it is chiefly remarkable for the prevalence of peculiar and aberrant types, while artiodactyls are very abundant in Europe and have a much more modern facies than their supposed contemporaries here. No member of the *Anoplotheriidae*, *Xiphodontidae*, *Dichodontidae*, *Cenotheriidae*, *Tragulidae*, or *Hippopotamidae* is known to occur in the western hemisphere. The *Anthracotheiidae* are represented here only by *Hyopotamus* and *Entelodon*. Of the primitive *Suidæ*, *Hyotheiium* is perhaps common, but the true swine are as closely confined to the Old World as the peccaries are to the New. In the same way the true ruminants appear much earlier in Europe, and the immense assemblage of miocene ruminants is here scantily represented by *Blastomeryx* and *Cosoryx*. Peculiar American forms are the primitive camels, *Leptotragulus*, *Poebrotherium*, *Procamelus*, &c., and the great

family of the *Oreodontidae*; *Leptomeryx* and *Hypisodus* appear also to have no very close allies in the Palearctic. Nothing can be more striking in looking over series of tertiary mammals from the two continents than the great preponderance and modern aspect of the European artiodactyls.

Proboscidea are distributed with great uniformity over both regions, save that *Dinotherium* is unknown in America.

Rütimeyer has recently announced the very interesting discovery of Condylarthra in Eggerkingen, but they are vastly more abundant in America. Of the Amblypoda, *Coryphodon* is common to both regions, but is much more abundant in the Nearctic, and many generic variations of this type, as well as the entire sub-orders of the Dinocerata and Taligrada, occur only here.

Edentates are more numerous and appear earlier in the New World, while the Tæniodonta and Tillodonta are confined to it.

Insectivora, Chiroptera and Rodentia are all more abundant and varied in Europe. Creodonta on the other hand occur far more numerous and of much greater variety in America. A few creodont genera appear to be common to the two sides of the ocean, as *Miocænus* and perhaps *Miacis* and *Hycænodon*, though the American species of the latter show certain constant differences which are perhaps of generic value. *Oxyæna* has been reported from France, but the identification is still uncertain. "Representative genera" also occur; thus *Stypolophus* is closely allied to *Proviverra* and *Cynohyænodon*, *Protopsalis* to *Pterodon*. Each region contains forms peculiar to itself.

In the Carnivora the difference is far more striking; the first undoubted members of this order in America appear in the lower miocene, and till the uppermost miocene (Loup Fork) the region possessed only dogs and cats, the latter belonging for the most part to the *Nimravidae* or false sabre-tooths. In the Loup Fork the mustelines begin to appear, but are very sparsely represented.

In Europe, on the other hand, the oligocene and miocene abound in dogs, cats, viverrines, mustelines, and the beginnings of the bear series, *Amphicyon*, &c. It seems probable that not a single miocene carnivorous genus is common to the two regions (except perhaps *Canis*), as the genera of American dogs which have been referred to *Amphicyon*, *Cynodictis* and *Galecyne* are really distinct and will require new names, while the *Nimravide* forms are an exclusively American family. The viverrines and hyenas never reached America at all.

This series of striking resemblances and still more striking differences between the tertiary mammals of the Old World and the New, would seem to imply the existence of a land connection in the north, which allowed the intermigration of some groups, while barriers, perhaps climatic, prevented the passage of others. The spreading of a genus from its centre of origin must have been a slow process, and when it appears in the other region, it has generally been sufficiently modified in the transition to require a new name. Another cause of discrepancy probably lies in the absence of strict contemporaneity between the formations of widely separated regions. The discovery of the tertiary mammals of Siberia and Alaska will probably throw much light on these puzzling questions.

EUROPEAN FOSSIL VERTEBRATES
LATELY ADDED TO THE MUSEUM.

W. B. SCOTT.

Through the liberality of Mr. Pyne of New York, the museum has received a very extensive and valuable collection of fossil vertebrates from the miocene of St. Gerand le Puy (Allier), consisting of many thousands of specimens, most of them in a fine state of preservation, though it is rare to find several bones belonging to the same individual associated together, as so commonly occurs in the tertiary specimens from the Western

United States. As yet the collection has been merely unpacked, cleaned and roughly sorted; the work of identification, especially of the birds, will require much time.

The *reptiles* are not of particular interest, except as bearing upon questions of geographical distribution, tertiary reptiles for the most part differing so slightly from recent ones. Of this group the collection comprises some hundreds of lizards, crocodiles and turtles.

Birds are represented by a very large series of specimens, several thousands in number, and embracing a wide range of families and genera, though as yet no attempt has been made at genuine identification. The waders appears to be the most abundant group.

The Mammals are also very abundantly represented and to some extent they have been identified. The following genera have been found: (1) CHIROPTERA; *Paleonycteris*. (2) INSECTIVORA; *Paleoerinaceus*. (3) RODENTIA; *Myoxus*, *Titanomys*, *Sciurus*, *Stenofiber*. (4) CARNIVORA. *Potamotherium*, *Amphicyon*, *Cephalogale*, *Cynodictis*, *Plesictis*, *Plesiogale*, *Viverra*, *Herpestes*, *Amphictis* (?), *Proailurus*. (5) PERISSODACTYLA; *Aceratherium*, *Chalicotherium*. (6) ARTIODACTYLA; *Cænotherium*, *Dremotherium*, *Amphitragulus*.

This list gives but a meagre conception of the richness of the collection, which forms a most welcome addition to the working capacities of the museum, especially as European fossil vertebrates are so scantily represented in American museums, and American specimens are still more rare in the European collections. It is due more to this cause than any other that a plentiful crop of errors has arisen in the identification of the extinct vertebrates of the two continents. Drawings and casts are a most unsatisfactory substitute for original specimens.

Besides the above, a small series of mammals from the phosphorites of Quercy was added during the summer by purchase, comprising, *Bachitherium*, *Prodremotherium*, *Plesi-*

siomeryx, *Cænotherium*, *Adapis*, *Cynodictis*, *Mustela* and *Viverra*. *Paleomeryx* or *Prox* from Steinheim. We have also received by exchange from the Palæontological Museum at Munich, the following genera: *Paloplothidium*, *Palæotherium*, *Xiphodon*, *Diplobune*, *Pseudosciurus*, *Sciuroides*, *Adapis*, *Pseudorhinolophus*, *Hyænodon*, *Ursus spelæus*, *Cynodictis*, *Cephalogale*, *Plesictis*, *Stenoplesictis*, *Stenogale*, *Lutra*, *Aelurogale*, *Aceratherium*, *Hipparion*, *Anoplothidium*, *Xiphodontherium*, *Cænotherium*, *Plesiomeryx*, *Lophiomeryx*, *Prodremotherium*, *Bachitherium*, *Palæomeryx*, *Hyæmoschus*, *Hyotherium*, *Sciurumys*, *Theridomys*, *Protechimys*, *Nesokerodon*, *Myolagus*, *Stenofiber* and *Peratherium*.

SUMMARIES OF PAPERS READ BEFORE SCIENTIFIC SOCIETIES.

THE NEW HISTORY.*

By WM. M. SLOANE,

PROFESSOR OF HISTORY AND POLITICAL SCIENCE.

The New History differs from the old or artistic type of history in aim and scope. Its aim is simply the orderly and scientific arrangement of facts. The watchword of the new school of historians is research. It seeks to discover and apply laws of historical evidence, and deals with the state as the highest form of human sociability. Moreover, it recognizes that no society is independent either of contemporaneous societies or of its antecedents. Therefore it deals with the whole record in a given time, rather than with a single nation in all time. Its central doctrine is the unity of man and its corollary, the unity of history. It aims therefore to construct, out of the parts given by the investigation of such periods, a whole or universal history which shall be an indication of direction in scientific pur-

* Read at a meeting of the *Philosophical Club*, Dec. 6, 1888.

suit. An outline knowledge of general history should therefore be antecedent to all historical research.

The new history moreover includes, in its sphere, sociology—man in all his associations and all his pursuits; yet it deals not only with the psychology of the race but includes that of the individual: it is therefore wider in its scope than sociology. The physical school of historians and that of historical progress have much in common, though they differ in their philosophical standpoint. The latter are not much concerned about “history with an *a priori* clew,” as Kant called it, but seek to determine states of society, and how one state succeeds another, either by its inherent force or by individual effort, or by both. Hence it makes the people more important than the old history. In its study of the “lapsed classes,” it becomes realistic and democratic.

What is called the “science of history,” as distinguished from history proper, is an attempt to secure a wide basis for induction, covering not only historic time and historical peoples, but mankind before history, and peoples hitherto regarded as non-historic. This it does by the comparative study of mythology, archæology and philology. In the study of institutions the new history has, by this means, met with great success. It concludes, moreover, that, in comparison with the ages before history, our positive historical knowledge covers a period comparatively short, and that historical man has a long future. As to the possibility of prediction, enough has been done to show that, while history can never be an exact science, it may be made a practical one by the use of a method which it is slowly developing.

An interesting comparison may be drawn between the literary quality or realism of the modern history and that of other forms of letters, as; for example, fiction.

THE MEETING OF THE NEW JERSEY
HISTORICAL SOCIETY.

On September 28, the New Jersey Historical Society held their Autumn meeting in Princeton, in University Hall. The proceedings were opened by an address from President Patton, welcoming the society to this historic ground, and expressing the hope that the bonds between the Society and the College would become even closer. Dr. McCosh followed with a few well-chosen words. Several members of the College faculty took part in the proceedings. Professor Cameron gave a detailed description of the Battle of Princeton. Professor Frothingham called the Society's attention to a passage in the writings of a Syrian, James, Bishop of Edessa, (c. 700 A. D.) which evidently refers to the continent of America.

THE MEETING OF THE ORIENTAL SOCIETY.

At the Autumn meeting of the American Oriental Society, held in Philadelphia on October 31 and November 1, papers were read by Dr. WM. H. GREEN, of the Seminary, on the Names of the Hebrew Tenses; by Professor MARQUAND, on the Rock-cut Tombs of Paphlagonia, and by Professor FROTHINGHAM on Mohammedan Education.

THE PROTO-DORIC CHARACTER OF THE PAPH-
LAGONIAN TOMBS.

By ALLAN MARQUAND,
PROFESSOR OF THE HISTORY OF ART.

These tombs, described by Prof. Hirschfeld in the *Abhandl. d. k. preuss. Akad. d. Wissensch. zu Berlin v. Jahre 1885*, merit more wide-spread attention as proto-Doric monuments. In these rock-cut tombs we find reminiscences of the gable roof, of gable sculptures, portico, antae, and columns with unformed capitals resembling the Doric. The high gable, the sculpture in low relief, the missing triglyphon, and the low, unchanneled, tapering shafts provided with bases and with capitals showing an undeveloped echinus, bring these tombs into closer relation with Mykenæan and early Etruscan

monuments than with the monuments of developed Doric architecture. The variation in the use and style of the columns, and all the structural and ornamental details exhibit the Paphlagonian independence of Hellenic models.

THE NAMES OF THE HEBREW TENSES.

By WM. HENRY GREEN,
PROFESSOR OF ORIENTAL AND O. T. LITERATURE,
THEOLOGICAL SEMINARY.

The doctrine of the tenses has always been considered one of the most perplexed subjects of Semitic grammar, since their use differs so materially from that of occidental languages; and not a little difficulty has been experienced in finding such designations as may fitly describe them. The old names "preterite" and "future," seem to be inapplicable to verbal forms, which are not limited respectively to past and future action, but each is capable of being employed in different connections of that which is past, present, or to come. Professor Lee of Cambridge, (1827), proposed "present" instead of "future." De Sacy called this tense the "Aorist." Ewald in the first edition of his Hebrew Grammar, (1827), denied the existence of tenses in Hebrew, and substituted in their place the first and second mode. In the second edition, (1835), he adopted the designation of Perfect and Imperfect, which has since come into general use, although the strict congruity of these terms with the meanings of the tenses to which they are applied, has been disputed in various quarters. Bötticher (*Lehrbuch*, II. p. 379), proposes *Fiens* (*becoming*), as more suitable than either Imperfect to which in his view it is "very rarely (*höchst selten*) equivalent," or Future, which he considers "only partially" correct. According to Dr. Driver (*Use of the Tenses*, p. 2), "the term *imperfect* does not in strictness correspond to a primary but to a derived characteristic of the tense called by that name"; it would be better described as "incipient," since it

"indicates action as nascent" and "ready or about to take place," (p. 32). "Imperfect" is a sufficiently apt designation of certain uses of the tense, as when it is employed as a progressive present, or a progressive past, or a frequentative past, in all which cases the action may be regarded as incomplete. But it cannot with propriety be applied to the tense in its most frequent signification and that which it has when the tenses are contrasted and which would accordingly seem to be its fundamental meaning, viz., the expression of that which is future. That cannot be fitly called "*imperfect*," which has as yet no existence, but is to come to pass hereafter, which is conceived not as partly done, but as not done at all, and to be done in the future. The notions of incompleteness and of futurity, are quite distinct; and it can only lead to confusion of thought to identify them. Neither can that be fitly called "*perfect*," in the sense of completed action, which when joined with Vav Consecutive may have a progressive or frequentative sense.

The question is accordingly raised whether this new nomenclature, now so generally adopted, of *perfect* and *imperfect*, has in point of fact any real advantage over the old designations, which it has superseded, of *preterite* and *future*. It is antecedently very improbable that the Semitic tongues should be unable to express so important a factor as the time of an action, except in an indirect way through the medium of the complete and the incomplete. The apparent incongruity in the use of the terms *preterite* and *future* is at once removed when it is remembered that the tenses are used not only in an objective but in a subjective manner; that is to say, they may be estimated either from the actual present, the moment of speaking, or from some ideal present to which the speaker in thought transfers himself and which is indicated to his hearers by the connection. An act prior to the time of speaking may be con-

ceived and spoken of as future, if surveyed from a point yet more remotely past; and a future action surveyed from a still more distant future, may be conceived and spoken of as past. The Shemite, with his lively imagination, lives in the midst of that which he describes, and he shifts his ideal standpoint with a freedom and a frequency that occidentals can scarcely comprehend. This must be assumed in explaining the tenses on the modal hypothesis. And yet, if it be assumed that hypothesis becomes unnecessary, for every employment of the tenses can then be accounted for, if they are taken in their temporal import. The future extends indefinitely onward from the ever shifting and momentary present. It is naturally and properly used, therefore, not only for all that lies wholly in the future, more or less remote, but also for that which is begun in the present and continued in the future, *i. e.*, a progressive present: or, if the position of the speaker is mentally shifted to a point in the past, it may represent a progressive past, or a habitual past, or a past action vividly conceived as in progress.

That the apparent departure from the strict temporal signification of the tenses does not require the modal hypothesis to account for it, but that it is to be explained in the manner now suggested, may be further confirmed by the fact that, in passages where the tenses seem to be most promiscuously used, their meaning is nevertheless regulated either by some verb at the outset or by the drift of the entire connection, which fixes the standpoint from which all is to be determined: and it has additional confirmation in the fact that it is not in unimpassioned prose, but in elevated poetry that the tenses are used in the most unexpected manner, which again shows that this use is traceable, not to a modal quality inherent in the form, but to the excited fancy of the poet, who views everything from his own ideal standpoint.

THE DEVELOPMENT AND CHARACTER OF
MOHAMMEDAN EDUCATION.

By A. L. FROTHINGHAM, Jr.
PROFESSOR OF ARCHÆOLOGY.

The subject of Mohammedan education during the Middle Ages has not yet been adequately treated, though partial or incorrect attempts have been made on a small scale by Wüstenfeld, Veth, Haneberg, and others. After the Arabs had been for some time subjected to the cultured influence of the peoples they had conquered, they developed a culture, part of which was an original and interesting system of education, which we see in most perfect operation from the middle of the viii to the close of the x century A. D. The Persians contributed in a large degree to the rise of learning, though the knowledge of the classic world was imparted to the Arabs by the Syrians. Only when the democratic spirit of Mohammedanism had succeeded, after a struggle of more than a century, in throwing down tribal and racial barriers, did education take a firm hold. After culture had been some time confined to studies connected with religion—to the exegesis of the Koran, the traditions, jurisprudence, and such auxiliaries as Arabic grammar and lexicology—it was enlarged to a great extent by the scientific movement under the Abbassidae. At its broadest, the Mohammedan curriculum was as follows. I. Koranic sciences: *a.* reading, *b.* interpretation. II. Traditional sciences and Jurisprudence: *a.* principles of jurisprudence, *b.* body of traditions. III. Scholastic Theology. IV. Intellectual sciences: *a.* logic, *b.* mathematics, *c.* astronomy. V. Experimental and natural sciences: *a.* physics, *b.* chemistry, *c.* botany and natural history, *d.* medicine, *e.* geography. VI. Linguistic sciences: *a.* grammar, *b.* rhetoric, *c.* lexicology, *d.* philology, *e.* poetry, *f.* literature.

Some characteristics of this education, deduced from a great mass of material, may be stated. It was conducted on the democratic principle of equality, without

regard to class or color; it was free of charge, free of prejudice, free in method and organization; it was decidedly moral; it was broad, and general, applicable to all, and calculated to develop the whole man. In the elementary stage, only one or two branches were taught at a time; corporal punishment was deprecated; the faculty most trained was the memory, and versified manuals teaching the elements of all sciences were learned by heart. In advanced education, two prominent characteristics were freedom of discussion between the professor and his pupils or other teachers, and the universal custom of travelling.

The three teaching institutions were the school or *mekteb*, the college or *medresseh*, and the mosque, which served as a university building. Teachers and professors received no fixed salary, relying on voluntary contributions; neither were they regularly appointed, but set up of their own initiative when provided with the *idjaza* or doctor's degree. At the colleges, instruction was not only free, as at the schools, but the poor scholars were even fed and clothed at the expense of the institution, which lived on a State grant or on the revenue from property derived from private donations.

In opposition to the ordinary notion of Oriental absolute fatalism, the Mohammedans of this period believed for the greater part in a strong degree of freedom and personal responsibility; and, in fact, the freedom allowed in education amounted almost to license. Consequently, there were numerous theories afloat regarding education, its scope and its character, two of the most interesting being those of Ibn Khaldûn and Ibn Tophail.

REVISED TABULAR NOMENCLATURE FOR TROCHOIDAL CURVES.

By F. N. WILLSON, C. E.,

PROFESSOR OF DESCRIPTIVE GEOMETRY, STEREOTOMY
AND TECHNICAL DRAWING.

Among the endorsements of the new terms presented before the American Association

for the Advancement of Science, in 1887, I have received the following from Professor Francis Reuleaux, Director of the Royal Polytechnic Institution of Berlin:

"I agree with pleasure to your discrimination of major, minor and medial hypocycloids, and will, in future, apply these novel designations."

He also suggests that a single extension is possible in the nomenclature as at that time presented, providing for those curves which may be considered as an inversion of the "linear trochoids," viz.: those in which the *rolling* circle has an infinite radius. For such curves he had used, though up to the time of writing had not published, the name *cyclo-orthoid*, orthoids being the paths of points in a fixed position with respect to a straight line rolling upon *any* curve, and *cyclo-orthoid* therefore implying a circular director or base-curve.

This I am glad to add to the original table, at the same time substituting its inverse — *ortho-cycloid* — for the less self-explanatory term "linear trochoid."

Names of curves that can be trochoidally generated in two ways, as for example, the prolate epitrochoid as a curtate peritrochoid, are preceded in the table by the same letter.

In addition to the more general nomenclature a tabular arrangement is subjoined of the names of the more interesting special forms of trochoidal curves, with the values of the radii for each case. In both tables *R* represents the radius of the rolling circle, *F* that of the fixed circle, and *t. r.* the *tracing radius*, or distance from centre of rolling circle to point generating the trochoid.

N. B.—In the second table two terms suggested by Prof. Reuleaux appear. The first, *concentrated form*, is for the smallest trochoid that can be generated for given values of *R* and *F*. Inverting the combination and making the tracing radius equal to the sum of the radii of rolling and fixed circles gives the *homocentric form*.

[* An extension of the nomenclature presented in a paper read before the American Association for the Advancement of Science, in 1887.]

REVISED TABULAR NOMENCLATURE FOR TROCHOIDAL CURVES.

TROCHOIDS.

Position of Tracing or Describing Point.	Circle rolling upon Straight Line. ($F = \infty$)	Circle rolling upon circle.						Straight Line rolling upon Circle. ($R = \infty$)
		External contact.	Internal contact.				Cyclo-orthoids.	
			Smaller circle rolling.			Medial Hypotrochoids.		
			$2 R > F$	$2 R < F$	$2 R = F$			
On circumference of rolling circle.	Ortho-cycloids	Epitrochoids.	Larger circle rolling. Peritrochoids.	Major Hypotrochoids	Minor Hypotrochoids	Straight Hypocycloid.		Involute.
	Cycloid.	(a) Epicycloid.	(a) Pericycloid.	(d) Major Hypocycloid.	(d) Minor Hypocycloid.			
	Prolate Trochoid.	(b) Prolate Epitrochoid.	(c) Prolate Peritrochoid.	(e) Major Prolate Hypotrochoid.	(f) Minor Prolate Hypotrochoid	(g) Prolate Elliptical Hypotrochoid.	Prolate Cyclo-orthoid +	
	Curtate Trochoid.	(c) Curtate Epitrochoid.	(b) Curtate Peritrochoid.	(f) Major Curtate Hypotrochoid.	(e) Minor Curtate Hypotrochoid.	(g) Curtate Elliptical Hypotrochoid.	Curtate Cyclo orthoid.†	

† Points are considered as within the rolling circle of infinite radius when they lie on the normal to its initial position, and on the side toward the centre of the fixed circle.

SPECIAL FORMS OF TROCHOIDS.

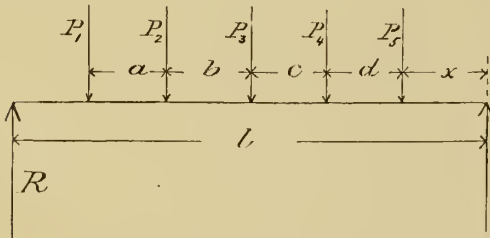
Tracing radius = R.			Tracing radius < R or > R.		
Epicycloids.	Hypocycloids.	Pericycloids.	Epitrochoids.	Hypotrochoids.	Petrochoids.
Cycloid. (F = ∞).	Straight line. (R = $\frac{F}{2}$).	Involute. (R = ∞).	Concentrated Form. (t. r. = o).	Concentrated Form. (t. r. = o).	Concentrated Form. (t. r. = o).
Cardioid. (R = F).	Four cusped Hypocycloid (R = $\frac{F}{4}$).	Cardioid. (R = 2 F).	Limaçons, (R = F).	Ellipses, (R = $\frac{F}{2}$).	Limaçons. (R = 2 F).
Nephroid, (R = $\frac{F}{2}$), (Blencipid Epicycloid).		Nephroid. (R = $\frac{3F}{2}$), (Blencipid Pericycloid).	Spiral of Archimedes, [t. r. = F]	Homocentric Form. (t. r. = R + F).	Homocentric Form. (t. r. = R + F).
			Trisectrix. [$\frac{R=F}{t.r.=2F}$]		
			Homocentric Form. (t. r. = R + F).		

A METHOD OF FINDING THE GREATEST BENDING MOMENT IN A PLATE GIRDER OR IN A FLOOR-STRINGER OF A RAILWAY BRIDGE UNDER ANY GIVEN SET OF CONCENTRATED ROLLING LOADS.

By CHARLES McMILLAN,
PROFESSOR OF CIVIL ENGINEERING.

The following method of determining the load under which the greatest bending moment will occur, and therefore, also, of computing the magnitude of that moment, is suggested to those who prefer analytic to graphic methods, in the belief that it is more direct and more economic of time than that ordinarily employed by computers.

For the purpose of demonstration, a girder whose length is l will be assumed to be loaded with five weights spaced as in the figure. All these spaces are constant except x , the variable distance from the rearmost weight to the right end of the girder.



Making, for brevity, $P_1 + P_2 = B$, $P_1 + P_2 + P_3 = C$, $P_1 + P_2 + P_3 + P_4 = D$, and representing the sum of all the loads by ΣP , the reaction at the left end of the girder will be

$$R = \frac{P_1 a + Bb + Cc + Dd + \Sigma P \cdot x}{l}$$

The greatest bending moment in the girder will occur under one of the interior loads. But a sufficient number of bending moments will here be considered, to reveal certain properties.

Writing in succession, with appropriate subscripts, the expressions for the moments at the points of application of the several loads, substituting therein the above value

of R , and applying the tests for maxima, the values of x which will give these moments their greatest values will be found to be

$$\left. \begin{aligned} x_1 &= \frac{1}{2} \left(l - a - b - c - d - \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \\ x_2 &= \frac{1}{2} \left(l - b - c - d - \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \\ x_3 &= \frac{1}{2} \left(l - c - d - \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \end{aligned} \right\} \dots (1)$$

with similar expressions for the others. The subscripts indicate the moments to which these distances correspond.

The resulting greatest values of the moments are, therefore,

$$\left. \begin{aligned} M_1 &= \frac{\Sigma P}{l} \left[\frac{1}{2} \left(l - a - b - c - d + \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \right]^2 \\ M_2 &= \frac{\Sigma P}{l} \left[\frac{1}{2} \left(l - b - c - d + \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \right]^2 - P_1 a \\ M_3 &= \frac{\Sigma P}{l} \left[\frac{1}{2} \left(l - c - d + \frac{P_1 a + Bb + Cc + Dd}{\Sigma P} \right) \right]^2 - P_1 a - Bb \end{aligned} \right\} (2)$$

&c., &c., &c.

It is, of course, understood that these equations hold good only when the weights above considered remain on the girder, and no new ones are brought upon it, while the system of weights is shifted back and forth into the positions indicated by eq's. (1); also, that the same set of rolling loads which will cause the greatest bending near the middle of the girder will not always produce the greatest moments that may occur at points nearer the ends—a consideration which is important in the case of a girder with flanges of variable cross section.

Attention is called to the extreme simplicity of the step whereby the entire quantity within the major brackets of one equation of moments can be transformed into the corresponding quantity in another; also, to the ease with which, having once written one of these equations, not only can all the others of the same set be written from analogy, but even the maximum value of the moment under any one of any other set of loads can be deduced similarly. Thus, the greatest moment under the second of a set of four weights (counting from the left) will be

$$M_2 = \frac{\Sigma P}{l} \left[\frac{1}{2} \left(l - b - c + \frac{P_1 a + Bb + Cc}{\Sigma P} \right) \right]^2 - P_1 a$$

* Abstract of a paper read before the Princeton Science Club, Jan. 12th, 1888.

and the moment under the fourth of a set of six weights will be

$$M_4 = \frac{\Sigma P}{l} \left[\frac{1}{2} (l - d - c + \frac{P_1 a + Bb + Cc + Dd + Ee}{\Sigma P}) \right]^2 - P_1 a - Bb - Cc$$

In each of these equations, the quantity within the major brackets is the abscissa from the right end of the girder to the centre of gravity of all the loads in the particular position which gives the maximum value of the corresponding moment. Each abscissa can be shown to be numerically equal to the distance from the left end of the girder to the particular weight under which that moment occurs. Hence follows the well-known rule to the effect that the greatest moment which can occur under any one of a given set of rolling loads will be found when the middle of the span is midway between that load and the resultant gravity line of all the loads. But this rule does not define the proper position of the system for the greatest moment of all, nor does it indicate the weight under which that moment will be found.

The abscissa, once computed, can be employed directly for ascertaining whether, in the corresponding position then occupied by the system, any of the weights have passed off from the girder, or new ones have been brought upon it. If preferred, the corresponding value of x [eq's (1)] can be used for the same purpose. [Compare corresponding values of the abscissa and x].

Resuming equations (2), it can be shown that $M_3 \geq M_4$ when

$$C \frac{l}{\Sigma P} \geq \frac{1}{2} (l - c - d + \frac{P_1 a + Bb + Cc + Dd}{\Sigma P}) + \frac{1}{4} c \dots (3)$$

While this condition has been deduced from a comparison of M_3 and M_4 in a set of five weights, it will be found to be typical in form; and the modifications necessary for fitting it for a comparison of any two adjacent moments caused by any given set of weights are made apparent by comparing it with the figure to which it applies. Thus, in a set of four weights, $M_2 \geq M_3$ when

$$C \frac{l}{\Sigma P} \geq \frac{1}{2} (l - b - c + \frac{P_1 a + Bb + Cc}{\Sigma P}) + \frac{1}{4} b$$

while, in a set of six weights, $M_3 \geq M_4$ when

$$C \frac{l}{\Sigma P} \geq \frac{1}{2} (l - c - d - e + \frac{P_1 a + Bb + Cc + Dd + Ee}{\Sigma P}) + \frac{1}{4} c$$

Here, again, the abscissa of the centre of gravity of all the loads appears. Therefore, if this test be employed for the purpose of ascertaining the relative magnitude of any two adjacent moments, the largest part of the work of calculating one of these moments (the one on the left of the sign of inequality) will have been performed in the computation of the abscissa. While, should the inequality prove the other moment to be the greater, the abscissa already computed can at once be changed to the proper value for that other moment, by simply adding to it one half of the distance between the two weights under which the two moments under consideration occur. [See equations (2)].

Should there be reason to suspect, from the given loads and their spacing, that the moment under the weight on the right will prove to be the greater, it may be more convenient to use, instead of a statement in the form of (3), one of the following form:—

$$M_3 \geq M_4 \text{ when}$$

$$C \frac{l}{\Sigma P} \geq \frac{1}{2} (l - d + \frac{P_1 a + Bb + Cc + Dd}{\Sigma P}) - \frac{1}{4} c$$

For, the quantity within the brackets, taken with its coefficient, $\frac{1}{2}$, is then the abscissa corresponding to the moment which is suspected to be the greater; and should the surmise prove correct, the abscissa need not then be changed as a preliminary to computing the moment.

It may be interesting to note, that if the inequality of the form (3) is deprived of its last term (in the case used for illustration, $\frac{1}{4} c$), and is then written as an equality, it becomes equivalent to the equation of condition for the maximum moment at a given point, as usually written, viz.,

$$\frac{h}{l} = \frac{P_1 + P_2}{\Sigma P} + \&c.$$

The advantages claimed for the method here given for determining the greatest moment in a stringer or plate girder are, that

it avoids the necessity for calculating two separate moments in order to determine their relative magnitudes; and, that in applying the proposed test for the maximum, a large part of the work which would ordinarily be involved in the calculation of the greatest moment will already have been accomplished, leaving but a few operations to be performed for the completion of that calculation.

The very simple conversion of one abscissa into another, and the similarity of their expressions to the corresponding values of x , have not, so far as the writer's knowledge goes, been pointed out before.

SUMMARIES OF PAPERS PUBLISHED.

Notes on Christian Mosaics. III. The Lost Mosaics of the East.

By A. L. FROTHINGHAM, Jr.

In this paper is given a list of extant early and late Byzantine wall mosaics, but a detailed account of them is deferred. The lost mosaics are then described, from texts of writers ranging from the IV cent. A. D. to the present century. The art of mosaic painting was almost a creation of Byzantine artists and no century is without examples. Especially remarkable, for the mediæval period, were the secular mosaics with which the royal and private palaces and public building were adorned. The following is a bare enumeration:

Cent. A. D.—Secular Mosaics.

- | | |
|----------|---|
| c. 465. | Constantinople, Palace of Prefect Constantine. |
| V. | " Baths of Zeuxippos. |
| c. 560. | " Palace of Justinian. |
| c. 602. | " Tomb of Empress Constantia. |
| c. 605. | " Portraits of Constantine and Helena. |
| c. 835. | " Theophilos' mosaics in Imp. Palace. |
| c. 850. | Constantinople, The Gymnasium (Michael III). |
| c. 875. | " Basil: the Macedonian's mosaics in the Imp. Palace. |
| c. 890. | " Constantine Porh's mosaics in the Imp. Palace. |
| c. 1000. | " Basil's Junior's mosaics in Public Baths. |
| c. 1170. | " Mosaics in Palaces of Manuel Komnenos. |
- Ecclesiastical Mosaics.*
- | | | |
|---------|---|---------------------------------------|
| IV. | Constantinople, Ch. S. Stephen | } Mosaics executed under Constantine. |
| " | Ch. the Apostles | |
| | Bethlehem, Bas. of Nativity | |
| | Jerusalem, Ch. Holy Sepulchre | |
| | Antioch, Basilicas built under Valens (364-79) and Theodosios II. | |
| V. | Constantinople, Ch. St. John. | |
| " | Ch. of the Virgin <i>ad Blachernas</i> . | |
| " | Ch. St. Polyeuktos. | |
| VI-VII. | Gaza, Basilicas. | |
| | Damascus, Basilicas. | |
| | Constantinople, Churches built by Justinian, especially Sta. Sophia. | |
| " | Mosaics under Phokas. | |
| IX. | " Mosaics under Basil, Maced. | |
| XI. | " Ch. S. George in Mangana. | |
| XII. | Churches of Palestine: Mosque of Omar and Ch. of Holy Sepulchre at Jerusalem, Bas. of Nativity at Bethlehem, etc. | |

Byzantine mosaics may be classified under four periods. The first begins with Constantine, and is almost identical in character over the whole empire. In the second period, beginning under Justinian in the sixth century, mosaic painting in the East, leaving the Roman type, assumes a more distinctly Greek character, and is refined and even more classic than before. After a slight decadence, a third period begins, in the IXth century, with Basil the Macedonian, under whom art takes up classic traditions again in a more modified form, though we see a beginning of the severe and ascetic style which afterward becomes prevalent. The fourth period, under the Komnenoi of the XIIIth century is one of decadence: the grace and classic character of former times is lost, art becomes fossilized, the figures are elongated, and become stiff and severe. This classifica-

tion into periods is convenient, but somewhat arbitrary; a purely Greek style appears even before Justinian, and the decadence begins before the Komnenoi and may be discovered in mosaics of the beginning of the xth century which show no traces of the revival under Basil.

The principal sources from which the descriptions of lost Eastern mosaics are drawn are: (1) either early Byzantine writers, like Eusebios, Joannes Malalas, Photios, Constantine Porphyrogenetos, Niketas, Joannes Lydus; or (2) the accounts of early travellers, such as the *Itineraria* and Quaresimus for the Holy Land, Pockocke's and Terzi's travels for the rest of the East, Clavijo and the texts in Banduri, *Imperium Orientale*, and Du Cange, *Constantinopolis Christiana* for the city of Constantinople. Earthquakes and conflagrations, always so common in the East, have done much to annihilate such works. The destruction of churches or the conversion into mosques by the Mohammedans have been a second potent cause for destruction.

[Summary of a paper printed in the *American Journal of Archaeology*, vol. IV, No. 2, pp. 127-48.]

An Archaic Patera from Kourion.

By ALLAN MARQUAND.

In the Cesnola collection of the Metropolitan Museum, New York, is an archaic silver patera found in room D of the temple at Kourion. The central medallion, probably a rosette, has entirely disappeared. Of the first ornamental zone only two lotus-flowers remain; but the juxtaposition of the flowers suggests a purely floral ornamentation or flowers interspersed with figures, as in the case of other paterae from Kourion. The second zone, bounded above and below by the torsade, contains ornaments partly symbolical (composite animals on either side of the Phoenician palmette or sacred tree) and partly pictorial (a huntsman in rapid pur-

suit of long-antlered stags). If we may look for more than mere decoration in the hunting scene, a local interpretation may be found by describing it as the Phoenician Herakles chasing the stags of Apollon, emblematical of the religious conflict between the Phoenician and Greek constituents of the population of Kourion. In contrast with this is the peaceful banquet-scene of the outer zone. Two chief personages recline upon couches on either side of a table laden with fruit; behind them are musicians and attendants. The meaning of this scene is not self-evident, but various considerations lead us to interpret it as representing the autumnal Adonis-festival, in which honor was paid to both Adonis and Aphrodite. The beautiful Idyl xv of Theokritos describes a famous festival to Adonis and Aphrodite given by Ptolemaios Philadelphos and Arsinoë at Alexandria. Aphrodite is addressed, in the song of the Argive Maiden, as a Kypriote goddess. The Kourion patera seems to give us an earlier Kypriote picture of a similar Adonis-festival.

[Abstract of a paper published in *The American Journal of Archaeology*, June, 1888.]

The Action of Sulphuretted Hydrogen on Arsenic Acid (Sulphoxyarsenic Acid.)

By LE ROY W. McCAY,
ASSISTANT PROFESSOR OF CHEMISTRY.

If a slow current of sulphuretted hydrogen be passed through a dilute solution of an alkali arseniate, acidified with hydrochloric or sulphuric acid and kept at about 70° C., there will be formed, in addition to a little pentasulphide of arsenic, a larger or smaller quantity of a free sulphonyarsenic acid which, under the influence of the strong mineral acid, or under the influence of the strong mineral acid together with the heat, splits up into arsenious acid and sulphur. The arsenious acid formed in this manner will be then attacked by the sulphuretted hydrogen, and forthwith thrown down as

trisulphide of arsenic. The equations corresponding to the reactions are as follows :

1. $\text{H}_3\text{AsO}_4 + \text{H}_2\text{S} = \text{H}_3\text{AsO}_3\cdot\text{S} + \text{H}_2\text{O}.$
2. $2 \text{H}_3\text{AsO}_3\cdot\text{S} + 3 \text{H}_2\text{S} = \text{As}_2\text{S}_5 + 6 \text{H}_2\text{O}.$
3. $2 \text{H}_3\text{AsO}_3\cdot\text{S} + 6 \text{HCl} = \text{As}_2\text{Cl}_6 + 6 \text{H}_2\text{O} + 2 \text{S}.$
4. $\text{As}_2\text{Cl}_6 + 3 \text{H}_2\text{S} = \text{As}_2\text{S}_3 + 6 \text{HCl}.$

The method of formation of the mixture of pentasulphide of arsenic, trisulphide of arsenic and sulphur, which one always obtains when a current of sulphuretted hydrogen is permitted to bubble slowly through an acidified solution of an alkali arseniate, has hitherto had no rational explanation. I venture to believe, however, that the process of production is now fully accounted for. Free sulphyarsenic acid, in a condition suitable for qualitative recognition, may be prepared in any one of the three following ways :

A. One adds to a cold, dilute, acidified solution of acid arseniate of potassium far less sulphuretted hydrogen than is necessary, in accordance with the ordinary textbook equations, to form the tri- or pentasulphide of arsenic. The liquid is brought into a flask, the flask well filled with cold, freshly boiled, water and corked, and the whole permitted to stand for twelve hours in a cold, dark place. The extremely small amount of finely divided sulphur is removed by adding asbestos pulp to the solution, shaking and filtering. If the experiment has been correctly performed, the filtrate will be clear, strongly acid and absolutely free from uncombined sulphuretted hydrogen.

B. A slow current of sulphuretted hydrogen is passed through a cold, dilute, acidified solution of acid arseniate of potassium until an opalescence makes its appearance, the gas is turned off, and the free sulphuretted hydrogen is at once precipitated by means of a very slight excess of a solution of sulphate of copper. The liquid is then stirred and filtered. The filtrate is clear, strongly acid and free from sulphuretted hydrogen.

C. The mode of procedure is as above, but instead of removing the gas with sulphate of copper, it is blown out of the liquid by means of a vigorous blast of air. The blast is permitted to act for about thirty minutes, asbestos pulp is added and the liquid is stirred and filtered. The filtrate is clear, strongly acid and free from sulphuretted hydrogen. Free sulphyarsenic acid, prepared according to any one of the above mentioned methods, reacts as follows :

1. After the addition of a large excess of hydrochloric or sulphuric acid it remains for some time perfectly clear.

2. Sulphuretted hydrogen produces no immediate precipitate. Sometimes hours pass before a precipitate makes its appearance.

3. Soon after boiling it commences to opalesce, the opalescence increases to a cloud and pure sulphur is deposited ; during the reaction, however, there is no generation of sulphurous acid or sulphuretted hydrogen.

4. If the boiled liquid be cooled, treated with asbestos pulp, well shaken and filtered, one obtains with sulphuretted hydrogen an immediate precipitate of trisulphide of arsenic.

5. Sulphate of copper produces no precipitate. I have made use of this fact in preparing the acid according to the second method.

6. Mercuric chloride occasions instantaneously a heavy, yellowish white precipitate. The precipitate is probably a sulphychloride of mercury.

7. Nitrate of silver gives immediately, in acid as well as in ammoniacal solutions, a heavy, black precipitate of sulphide of silver. The filtrate from the same, after the addition of a little more nitrate of silver, and, if necessary, of an excess of ammonia, can be boiled indefinitely without the separation of metallic silver. This fact clearly demonstrates the absence, in the liquid, of arsenious acid.

The free sulphoxyarsenic acid with which we here have to do is identical with the hypothetical sulphoxyarsenic acid whose existence, in the year 1845, was assumed by Bouquet and Cloez in order to explain the constitution of an extraordinary potassium salt which they had discovered and analysed, and for which they accordingly proposed the name Sulphoxyarsenate of Potassium.

I have prepared some chemically pure sulphoxyarsenate of potassium according to the directions of the two French chemists, and with a very dilute aqueous solution of the same, I have been able to obtain every reaction I observed in my examination of the three above mentioned filtrates. Owing to the ease with which solutions of the salt split up into arseniate of potassium, water and sulphur, Bouquet and Cloez concluded that the corresponding acid could not exist in the free state.

My researches, however, prove conclusively that, in spite of its great instability, sulphoxyarsenic acid can exist in the free state.

Free sulphoxyarsenic acid, then, not only exists, but its existence serves as a key for unlocking what, for almost half a century, has been a mystery to the chemical world—namely, the remarkable action of sulphuretted hydrogen on arsenic acid.

[Abstract of a paper with the above title which appeared in the *American Chemical Journal*, X, 6.]

Poison-Apparatus of Mosquito.

By G. MACLOSKIE,
PROFESSOR OF BIOLOGY.

It has been believed, but not hitherto proven, that the different species of Mosquito secrete a poison which prevents the coagulation of blood and of vegetable proteids. The present paper shows (1), that there are two sets of glands in the frotharox of the mosquito, one set on each side, each set consisting of three glands like a trefoil, each gland being one-hundredth of an inch long ;

(2), the ducts from these glands unite on each side into lateral ducts ; (3), these two lateral ducts coalesce in the neck into a common duct, lined with spirally striated ceritine and having a cavity one-sixth of an inch in diameter ; (4), the common duct enters the base of the hypopharynx, one of the piercing organs ; (5), the hypopharynx is traversed by a canal, and has a subterminal opening ; (6), from which very minute drops of a yellowish oily poison can be seen escaping. There is no exit for the secretion of the glands except by this piercing organ, which conveys it directly into the wound.

The dissections were made with the needles, by the assistance of a microscope having apochromatic objectives. I have to acknowledge a series of successful microscopic ribbon-sections executed in the E. M. Histological Laboratory. One of these sections is engraved, showing the tract of the poison duct and its connection with the hypopharynx. One set of the poison glands, showing their ducts uniting in the lateral duct is also engraved.

[Abstract of a Paper in *The American Naturalist* of Oct., 1888.]

The Contact Angles of Liquids and Solids.

By W. F. MAGIE, Ph.D.,
ASSISTANT PROFESSOR OF PHYSICS.

The investigations of Gauss in the theory of capillarity lead to an expression for the angle of contact between a solid wall and the surface of a liquid in contact with it, which depends upon the relations among the forces acting between elements of the liquid and those acting between elements of the liquid and of the solid. In some cases the contact angle is obtuse, in others is zero, but in certain other cases it may be acute but not zero. It is the object of the present investigation to discover, if possible, cases in which such a finite acute contact angle exists.

The experiments of Quincke and Traube have indicated the existence of a finite acute contact angle, but their work is open to criticism, in that the correction terms of the formulas employed were neglected, and the dimensions of the liquid surfaces experimented upon were such that the ordinary formulas, even with the correction terms, were not applicable.

The method employed in the investigation here presented was, in general, that used by Quincke. It consists of the comparison of the values of the capillary constant a^2 (equal to $\frac{2T}{D}$, where T is the surface tension and D the density of the liquid) obtained from two sets of measurements of the dimensions of a bubble of air formed in the liquid under a glass plate. From one of these sets of measurements the value of a^2 can be computed independently of any knowledge of the contact angle; and from the other it can be computed by making the assumption that the contact angle is zero. If this assumption is correct the two values of a^2 should, of course, agree, but if it is in error the formulas used show that the value of a^2 , obtained by the method involving the use of the erroneous assumption should be less than that obtained by the other method.

The liquids examined were contained in a plate glass tank, and the bubbles were formed under a concave lens of long radius. They were usually more than one hundred millimetres in diameter. For use in the formula not involving the contact angle the distance was measured between the bottom of the bubble and the horizontal plane containing the greatest section of the bubble. This measurement was made with a cathetometer microscope. For use in the formula involving the contact angle the distance was measured from the bottom of the bubble to the horizontal plane passing through the circle of contact of the bubble surface with the lens. This distance was determined by measuring the distance through which a

microscope, placed vertically over the centre of the bubble and the lens, was moved to pass from the point at which the image of a small piece of paper, carried on the end of the object glass, was seen clearly reflected from the bottom surface of the bubble to the point at which the image was seen reflected from the lower surface of the lens. From this distance, when account is taken of the displacement of the images caused by reflection at a curved surface and by passage through the thick lens, the distance of the bottom of the bubble from the centre of the lens surface is computed; and from this distance, by the use of the diameter of the bubble and of the radius of curvature of the lens, the desired distance is obtained.

In the following table are presented the values of a^2 obtained for the liquids examined by these two methods. The results of the first method are in the column headed a_q^2 ; those of the second method in that headed a_k^2 . Where the results of the two methods differed by more than the sum of the probable errors of the means of the individual determinations, the existence of a finite contact angle was inferred and its value approximately calculated. The contact angles are given in the column headed ω :

	a_q^2	a_k^2	ω
Distilled Water,	14.99	14.41	
	14.72	14.53	small.
Ethyl Alcohol,	5.652	5.626	0°.
	5.467	5.576	
	5.621	5.755	
	5.571	5.515	
Chloroform,	3.697	3.678	0°.
Acetic Acid,	8.577	8.345	20°.
Methyl Alcohol,	6.056	6.061	0°.
Formic Acid,	7.137	7.117	0°.
Turpentine,	6.434	6.270	17°.
Petroleum,	6.758	6.435	26°.
Benzine,	5.678	5.707	0°.
Ether,	4.977	4.855	16°.

The anomalous results for ethyl alcohol, in which the values of a_k^2 are greater than

those of a_q^2 may be explained as due to the presence of a small quantity of water left behind in the upper portion of the bubble surface by evaporation of the alcohol into the bubble at the circle of contact with the lens surface. The measurements in which this anomaly does not appear were made in such a way as to avoid this evaporation.

The close agreement of the a_q^2 and a_k^2 values in those cases in which no finite contact angle is inferred, by showing the general validity of the method of experimentation, strongly confirms the evidence of the existence of a finite contact angle in the other cases. An explanation of these finite contact angles may be given based upon an assumed evaporation at the circle of contact of the bubble and the lens, depending upon a temperature difference between the lens and the liquid, but it seems more probable that the finite contact angles were due to the relations among the molecular forces already referred to.

In conclusion it is shown, by a comparison of the values of the surface tensions and densities of the liquids examined, that the function expressing the law of the force between elements of a liquid is probably not the same nor of the same form for different liquids.

The author expresses his thanks to Mr. Taylor Reed and Mr. A. H. Scofield, Fellows in Experimental Science, for the assistance which they gave in the observations. The experiments were carried out in the Laboratory of Physics, and much of the apparatus was constructed by Mr. Fred. Fisher, the mechanic of the School of Science.

[Abstract of a paper published in the *London, Edinburgh and Dublin Philosophical Magazine* for August, 1888.]

"The Structure and Classification of the Mesozoic Mammalia."

By HENRY F. OSBORN.

This Memoir treats of the Mammalia which are at present known from the Mesozoic period, and is subdivided into the

following sections: I. The British Mesozoic Mammalia, embracing the writer's observations upon the collections in the British Museum, (Natural History). II. The classification and zoölogical relationships, embracing a system of classification for the British and American forms. III. The Origin and Succession of the Teeth, a discussion of the evolution of the primitive Mammalian dentition as found in these Mammals. IV. The Zoölogical Position of the Mesozoic Mammalia, a discussion of the probable relationships of these Mammals to existing forms.

[Journal of the Academy of Natural Sciences of Philadelphia, Vol. 1X., No. 2. July, 1886. Pp. 186-265. 4°, with two plates.]

"A Contribution to the Internal Structure of the Amphibian Brain."

By HENRY F. OSBORN.

This paper is based upon the observations upon the external and internal structure of the Amphibian Brain, made by the writer between 1879 and 1886. It includes a description of: I. The Divisions and Cavities of the Adult Brain. II. The Cranial Nerves, their external features and the nerve-fibre tracts, within the medulla oblongata, which give origin to them. This section includes a statement of the bearing which the arrangement of these *intra-axial* tracts has upon the grouping of the cranial nerves into motor and sensory pairs, homologous with similar pairs of typical spinal nerves. III. The Eucephalon, the disposition of the principal ganglia and nuclei, distribution of the fibres of the commissures and course of the supposed motor and sensory tracts in the brain.

[Journal of Morphology, Vol. 11., No. 1. July, 1888. pp. 51-92. 8°, with three plates.]

"The Evolution of the Mammalian Molar Teeth to and from the Tritubercular Types."

By HENRY F. OSBORN.

A paper read before the Geological Section of the British Association for the

Advancement of Science at Bath, September 8th. Abstract in *The American Naturalist*, October, 1888, p. 926, entitled, "The Nomenclature of the Mammalian Molar Cusps." Abstract in *British Association Reports*. Published in full in *The American Naturalist*, December, 1888. This paper contains a summary of recent observations by Professor Cope and the writer, upon the primitive form and the mode of evolution of the molar teeth of the Mammalia, showing, first, the universal development of *trituberculy* in the lower Eocene period; second, the mode of evolution of *trituberculy* in the Mesozoic period; third, the influence of *trituberculy* as a factor in the persistence or extinction of Mammalian types; fourth, the bearing of these observations upon the "Kinetogenesis," or Lamarckian, theory of the origin of variations; fifth, the proposal of a nomenclature for the cusps of the upper and lower molars founded upon their homologies and order of development.

"*Chalicotherium and Macrotherium.*"

By HENRY F. OSBORN.

A note upon M. Henri Filhol's discovery of the identity of these two genera, with observations of the writer, upon the distant relationship of *Chalicotherium* to the Ungulates, and *vs.* M. Filhol's supposition that it was an Edentate.

[*The American Naturalist*, August, 1888. pp. 723-9.]

"*Additional Observations upon the Structure and Classification of the Mesozoic Mammalia.*"

By HENRY F. OSBORN.

This paper is in advance of a Postscript to the above Memoir upon the same subject. During the past summer the rare collection of Mesozoic jaws and teeth in the Museums at Oxford, Bath, York and Rheims were

carefully figured and compared with those previously examined in the British Museum and elsewhere. This led to several discoveries which have an interesting bearing upon the origin of the primitive mammalia from reptilian ancestors.

[Proceedings of the Philadelphia Academy of Natural Sciences, November, 1888. pp. 292-301.]

MISCELLANIES.

NUMBER OF STUDENTS AT PRINCETON COLLEGE.

	1885-6.	1886-7.	1887-8.	1888-9.
Fellows,	7	7	10	12
University Students,	58	88	78	90
Seniors,	115	82	100	95
Juniors,	82	100	95	137
Sophomores,	103	97	143	126
Freshmen,	118	154	136	156
Specials.	19	35	49	60
	502	563	611	676
Names Repeated,	3	4	8	9
Totals,	499	559	603	667
Increase over last Year,				64
Over preceding Year,				108
Over next preceding Year,				168

RECENT DONATIONS TO THE COLLEGE.

At the meeting of the Board of Trustees, November 8th, the President reported that the following additions to the funds of the College had been recently received:

From Mrs. David Brown, of Princeton, \$50,000.

From Mrs. Robert L. Stuart, of New York, \$25,000.

From a friend, \$5,000, for five Scholarships.

Mrs. Brown's gift is to be used in building a new Dormitory.

AMERICAN PARTNERSHIP IN THE CLASSICAL REVIEW.

The *Classical Review* of London enters upon its third year, this January, and is hereafter to have an American Editorial Committee in addition to the English

editors. It will be published in this country by Ginn & Co., of Boston. Professors Wright of Harvard, Seymour of Yale, and Hale of Cornell, are the American Committee. The *American Journal of Philology* at Baltimore, has done such high work for general as well as classical philology, that the editors of the *Classical Review* have wisely determined not to interfere with the peculiar feature of the *Journal's* strength, namely—its elaborate original papers. The field of the *Classical Review* will be more that of a record and review of current progress, with full summaries of periodicals: short notes, and papers, items of information, book reviews, and other matter of like nature from the pens of classical scholars. We bespeak among Princeton men who have classical leanings, hearty encouragement for the *Review*.

PHILOSOPHICAL CLUB.

Princeton is to have another society beside the Science Club. It is termed the *Philosophical Club*, and consists of the members of the Faculty and Fellows belonging to the Philosophical Faculty, as defined in the College Catalogue, thus including not only the philosophical department proper but those of the historical and social sciences, of physiological psychology, of archaeology and art, and of pedagogics.

The first regular meeting of the Club took place on December 6. Meetings are to follow every first and third Thursday of the month, some being set apart for the reading of original papers, others for reports of recent progress in the several subjects represented by the members of the Club.

The first paper was read by Professor Sloane, on "The New History."

A RENAISSANCE DOORWAY.

Princeton has recently been so fortunate as to acquire possession of a remarkably beautiful example of Renaissance Decor-

ative Sculpture of the best period—a marble doorway from Venice. It has been purchased by Professor Marquand, and erected in the hall of his residence. The doorway evidently belonged to one of the most remarkable of the churches of Venice. In style it belongs to that family of eminent artists, the Lombardi, and its date appears to be about 1500 A. D. The pilaster-jambs and the lintel are adorned with ornamental carvings in relief, which are rich without being overloaded. It would be difficult to point out in Tuscany or in North Italy, many doorways superior to this in artistic beauty, and probably no European museum possesses its equal. It is unnecessary to add that it is the only work of its kind that has found a home in America.

THE ART MUSEUM.

The central portion of the Art Museum is now nearly completed. The workmanship testifies to the refined skill of the architect, Mr. A. Page Brown, of New York, and to the conscientious care of the builders, Messrs. Cubberly and Kafer, of Trenton. When the frieze is in place, the appearance of the building will be greatly improved. The frieze will be a reproduction in terra cotta of the Eastern portion of the frieze of the Parthenon, and will be presented to the College by the Perth Amboy Terra Cotta Company. Since the close of the last College year, one thousand dollars have been received through Mr. D. W. McWilliams, of Brooklyn. It is a matter of regret that sufficient funds have not yet been secured to bring this central portion of the building to completion. From \$8,000 to \$10,000 are still required to finish the upper story and to furnish the building with a furnace, electric lights, and cases for the Trumbull-Prime collection.

FRENCH ARCHITECTURAL PHOTOGRAPHS.

During the summer, Prof. Marquand made a tour of Northern and Western France,

carrying with him a camera and taking photographs ($6\frac{1}{2} \times 8\frac{1}{2}$ in.) of churches and other buildings.

Good negatives were secured of the following subjects: ABBAYE DE ST. GEORGES DE BOSCHERVILLE, w. front, s. transept and choir, interior n. transept. EVREUX; *cathedral*, w. front ext., nave and n. transept, n. portal, int. nave. LISIEUX, *Cath.*, inter. nave, choir aisle. CAEN, *Abbaye aux Hommes*, int. nave, choir, choir aisle; *Abbaye aux Dames*, w. front, int. nave; *St. Pierre*, ext. choir, int. nave; *old houses*. BAYEUX, *Cath.*, int. nave, choir. COUTANCES, *cath.*, w. front, int. nave, choir aisle; *St. Pierre*, ext. from s. w., int. nave; *St. Nicholas*, w. front. MONT ST. MICHEL, *Abbey*. LE MANS. *Cath.*, ext. choir, s. portal, nave, choir; *La Couture*, w. front, int. nave.

CHARTRES, *Cath.*, w. front, w. portal, buttresses, n. side, s. side, int. nave, n. portal, s. portal, s. portal sculptures (three views). AUXERRE, *Cath.*, w. front, sculptures on w. portal, n. portal, int. nave. *St. Germain*, tower. *S. Eusèbe*, tower. *St. Pierre*, w. front. NEVERS, *Cath.*, w. end, int. w. choir, e. choir. *St. Etienne*, w. front, ext. choir, int. nave. *Palais de Justice*. BOURGES, *Cath.*, w. front, w. portal, s. portal, s. side, int. nave. *St. Pierre Guillard*, int. nave. *Palais de Justice*, front, rear view. CLERMONT-FERRAND, *Cath.*, w. front, s. side, int. nave. *Notre Dame du Port*, w. front, s. portal, tower, ext. choir, int. nave. PERIGUEUX, *St. Front*, n. portal, int. nave, view from across river; *old house*; *Tour de Vésone*.

ANGOUÛÊME, *Cath.*, s. portal, s. side, n. side; *Hotel de Ville*. POITIERS, *Cath.* w. front, inter.; *Notre-Dame-la-Grande*, w. front, inter. nave; *Temple St. Jean*, w. front, n. side, s. side, inter.; *St. Rallegonde*, w. front; *St. Hilaire*, e. end, n. side, inter. *St. Savin*, *St. Sarin*, w. front, e. end, int. nave, choir.

TOURS, *Cath.*, w. front, towards e. end, inter. towards choir, towards west, cloister stairway; *St. Martin*, petit cloître. *Abbaye de Marmoutier*, portal de la Crosse, old entrance.

CHENONCEAUX, *Chateau* from distance, nearer view, old tower. SAUMUR, Dolmen of Bagnicux; *Notre Dame de Nantilly*, inter.; *Hotel de Ville*, exter. view from bridge.

ANGERS, *St. Aubin*, cloisters, tower; *Chateau*. *Maison Adam*; *Hotel d'Anjou*.

AMBOISE, *Chateau*, chapel St. Hubert; *Hotel de Ville*. CHAUMONT, *chateau*, portal.

These photographs may be purchased of Mr. Rose, of Princeton, at the rate of \$3 per dozen.

NOTES.

Professor C. A. Young delivered an illustrated lecture on *The Sun*, at Norwich, Connecticut, November 2d, and a lecture on *The Moon* before the Teachers' Institute at Trenton, New Jersey, November 15th.

Professor C. F. Brackett delivered an address before the Teachers' Institute at Trenton, New Jersey, on *The Teaching of Physics in the Common Schools*, November 16th.

S. T. Dodd, Fellow by Courtesy in Mathematics and Physical Science, is repeating in the Laboratory of Physics the experiments of Hertz on the propagation of Electricity through space, and the direct measurement of its velocity.

The third edition of Professor Hunt's edition of Caedmon's *Exodus* and *Daniel* has appeared from the press of Ginn and Co., Boston.

Professor Hunt has published the following papers since last June: "Matthew Arnold as an English Writer," in *The New Princeton Review*, Nov., 1888. "Modern Theories of Culture," *The Independent*, Nov., 1888. "Sacred Discourse," *Homiletic Review*, Sept., 1888. "Teachers and Teaching," *Christian at Work*, Oct., 1888.

The second volume of Professor Shields' *Philosophia Ultima* is passing through the press. In distinction from the former introductory volume, it will treat directly of the Science of the Sciences, and include, among other topics, their philosophical classification and logical organization and the true law of their historic evolution, in opposition to agnostic theories of knowledge.

The Latin text of the *Philobiblon* of Richard de Bury is now being printed for the Grolier Club of New York, by Mr. Theodore DeVinne. Professor West expects to complete the second volume, which is to contain the English version, with introduction and notes, in time to have both the Latin and English volumes issued together.

Mr. M. Harvey Liddell, the University Fellow in English, besides regular work in Anglo-Saxon Literature and Early English History under the direction of Professor Hunt, is studying the *Beginnings of English Fiction*, with a view to ascertaining the starting point of the English Novel. The rise of fiction may be considered as an event in the history of Modern Literature, or it may be regarded as a slow development reaching back into the past as far as Chaucer and the early ballads. Which of these views is the more reasonable and the more scientific it is his purpose to show. Having thus fixed and determined the starting point of English Fiction, "The Development of the Novel," "The Relation of the Literature of Fiction to Life," and "The Relation which the Novel sustains to other Forms of Literature," will be fruitful subjects for research and discussion.

ANNOUNCEMENTS.

New Optional and Elective Courses are offered (a) by Professor Osborn: a course of six lectures to Graduate Students upon Some of the present problems of Vertebrate Morphology. (b) by Professor Scott: (1) Structure of the Brain (Graduates), (2) Readings in Physiological Psychology, (Graduates and Seniors), (3) Vertebrate Embryology (Graduates and Seniors).

An optional course in *Experimental Chemistry* (one hour a week) is offered by Professor Cornwall to Academic and Scientific Seniors, without restrictions. The course consists only of class-room work, to illustrate outside reading.

The optional class in *English Literature* will meet weekly, and the authors discussed will be the later Victorian Poets. There will be readings from each author and comments

upon the passages read. The special attention of the class will be given to such authors as Gabriel Dante Rossetti, Aubrey De Vere, James Thompson, Edwin Arnold, Alfred Austen, Henry Austen Dobson, and Philip Bourke-Marston.

An optional course will be offered the second term in *Early and Chaucerian English*. The course will be open to Juniors and will be conducted by Professor Hunt.

Professor H. C. O. Huss offers the Seniors and Juniors of the J. C. Green School of Science, an optional course in *French*, on Victor Hugo's lyrics, and another in *German* conversation and composition. He invites all the students of the School of Science to avail themselves of his collection of modern French and German novelists for private reading.

Prof. Packard offers a Graduate Course in Early Sources of Roman Law: a Senior Elective on Lucretius and General Principles of Science of Language, and one on the Institutes of Justinian.

Professor Shields' elective course for the ensuing term will treat largely of the religious problems emerging in the sciences, both physical and psychical, and of the logical principles applicable to their solution.

A University course for graduates has been projected, embracing the *History of the Sciences*.

In the *Senior Elective Course in Physics*, a few lectures will be delivered, explaining the methods and summarizing the results contained in Professor J. J. Thompson's *Applications of Dynamics to Physics and Chemistry*; these will be followed by lectures on the elements of the theory of potential, on the methods of electrical measurement, and on dynamo-electric machines.

AMERICAN JOURNAL OF ARCHÆOLOGY.

VOL. IV. No 3. JUNE, 1888.

A. L. FROTHINGHAM, JR., *Notes on Christian Mosaics. III. The Lost Mosaics of the East.* A summary of this paper is already given on page 30.

CARL D. BUCK, *Inscriptions found upon the Akropolis.* Mr. Buck, a member of our School of Classical Studies at Athens, here gives the text, translation and commentary of three inscriptions found in 1887 in front of the Parthenon, and judged to belong to the close of the IV. cent. B. C. They refer to the dedication of certain vessels by manumitted slaves and bring up several questions in respect to the relation of slaves to their masters and to the conditions of manumission. "The point common to all is, that the freedmen had been accused of violating some one of the duties imposed upon them by the law or by special agreement, had been brought up under the *δίκη ἀποσταίου*, acquitted, and in their thankfulness had dedicated *φιάλαι* of the weight of one hundred drachmas each." ALFRED EMERSON, *A laughing girl and a study of coiffure: a terracotta head in Munich.* A charming terracotta head is published. It is probably the portrait of a slave-girl of the early Hellenistic period decked out with a coiffure which appeared to be entirely new.

ALLAN MARQUAND, *An archaic patera from Kourion.* A summary of this paper appears on page 31.

WM. HAYES WARD, *Unpublished or imperfectly published Hittite Monuments. III. Reliefs at Carchemish-Jerablus.* Some Hittite sculptures are published from photographs taken by the Wolfe Expedition to Babylonia: the first seems to represent a female goddess (Ishtar?) the second part of a procession of warriors. Both are in the late Hittite style, after it came under strong Assyrian influence.

A. L. FROTHINGHAM, JR., *Vetulonia and early Italic archaeology.* Attention is called to a series of interesting objects found on the site of the Etruscan city of Vetulonia, belonging to the tomb of some great chief of the VIth century B. C., if not earlier. These works, especially the beautiful silverplated cinerary coffer, the bronze ship and the silver-gilt cup, are examples of the various styles which flourished in Italy, and of the Phoenician and Oriental styles.

Reviews are given by A. L. Frothingham, Jr., of PERROT ET CHIFFEZ, *Histoire de l'Art*, vol. iv.; and by Allan Marquand of GUSTAV HIRSCHFELD, *Paphlagonische Felsengräber und Die Felsenreliefs in Kleinasien und das Volk der Hittiter.*

The ARCHAEOLOGICAL NEWS, *Summary of recent discoveries and investigations* occupies 29 pages, and the SUMMARIES OF PERIODICALS 39 pages.

Vol. IV., No. 3, September, 1888.

THE EDITORS, *The relation of the Journal to American Archaeology.* In answer to a correspondent who condemned the present attitude of the *Journal*, and demanded at least half its space for American archaeology, it is declared that American archaeology is prehistoric archaeology, *i. e.* deals with the works of savage races who never rise to culture and cannot consequently be compared in importance to the archaeology of the "perfect" races.

W. M. RAMSAY, *Antiquities of Southern Phrygia and the border lands.* III. In this paper Prof. Ramsay continues to publish the results of his recent investigations in Phrygia, including inscriptions from sites along the Pisidian-Pisidian frontier, the route of Manlius, and finally in some districts of Phrygia proper.

W. S. AMENT, *The ancient coinage of China.* A review is here given of a very little-known subject with which the writer was familiar through a residence of many years in China, and the formation there of a precious collection of ancient coins. The coins were usually composed of an alloy of copper and lead, or of copper and zinc; they were always cast, not struck. The earliest belong to the third millennium B. C., but the first coins with inscriptions, date from C. 544 B.C. They are of all shapes; the favorite form being round with a square hole.

JOSEPH T. CLARKE, *Gargara, Lamponia and Pionia; towns of the Troad.* The greater part of this paper is occupied with a monograph of Gargara, the sister city of Assos and one of the most important places in the Troad. Its true site was discovered by Mr. Diller, the geologist of our American Expedition to Assos. Extensive ruins of it still remain on the summit of the mountain called Qozlon, and the early city walls are still in part standing.

The NOTES are on the publications of the German Archaeological Institute; on the American School of Classical Studies at Athens; on Professor Putnam's work in the Ohio Valley; and on An American Student for the Egypt Exploration Fund.

Under DOCUMENTS, Prof. Frothingham edits texts supplementary to the inventories of the artistic treasures possessed in the Middle Ages by the Basilica of St. Peter in Rome, which were edited, a few years since, by M. Eugène Müntz and himself.

The ARCHAEOLOGICAL NEWS is remarkably full, covering 52 pages, and 28 pages are devoted to the SUMMARIES OF PERIODICALS.

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" Mathematical Sciences, Prof. William F. Magie.

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PRINCETON COLLEGE BULLETIN.

EDITED BY THE PRESIDENT AND MEMBERS OF THE FACULTY.

VOL. I.

MARCH, 1889.

No. 2.

THE PRESIDENT'S REPORT TO THE BOARD OF TRUSTEES.

The report made by the President to the Board of Trustees at their meeting on February 14th, contains, besides the usual account of the condition of the College and certain other matters which are necessarily of a private nature, a number of recommendations and announcements which are of interest to the Alumni, students, and friends of the College. We quote these directly from the Report.

"Dr. McCosh during the first half of the year has lectured twice a week to a large class of Seniors and Graduates on Metaphysics, and these lectures have just been published. He is now delivering a course of University Lectures on the 'Tests of Truth.'

I regret to say that Professor Johnston has been unable on account of serious illness to discharge the duties of his chair since the beginning of the present academic year. He is a deservedly popular professor, and the Senior Class have suffered a serious loss in being deprived of his instruction. He is improving however and we have good reason to hope that he will be able to resume work in the autumn.

Provision has been made for instruction in the departments embraced in Professor Johnston's chair. Thanks to the liberality of a member of this Board, we have secured the services of Professor Austin Scott of Rutgers College, who has been conducting two exercises a week in Political Economy with the Senior Class

during the present term. Professor Sloane has kindly undertaken Professor Johnston's work in International Law, and the President expects to lecture during the months of March, April and May on Philosophical Jurisprudence.

There are at present fourteen candidates pursuing studies in course for the Doctor's degree in addition to Mr. Henry Dallas Thompson who has had a special examination for the degree. Including Mr. Thompson there are seven candidates for the degree of Doctor of Philosophy, one for that of Doctor of Science, one for Doctor of Philosophy (in Science), and six for Doctor of Literature. There are ten candidates in the first year of their course, and four in the second year.

A request from members of the Senior Class for a Hebrew Elective having been presented to me, I availed myself of a former action of this Board regarding Semitic studies and requested Professor Frothingham to take charge of the Hebrew elective. He is now teaching a class of sixteen students, and I hope that we have in the work which he is doing, the beginning of a fully organized Semitic department.

The consideration of new Electives opens the whole subject of the College curriculum which a Committee of the Faculty has now under consideration. It has so far progressed as to recommend, with the unanimous approval of the Faculty, to the very favorable consideration of the Trustees' Committee on the Curriculum, that the Academic Year be divided into

two terms of nearly equal length, that the Second Term begin about the first of February, that the Spring vacation be abolished and that the College Session begin correspondingly later in the Autumn.

I find that it will be possible to build a Dormitory accommodating 80 students for \$50,000, the amount placed in my hands for this purpose by Mrs. David Brown. It gives me pleasure to say that Mrs. Brown has recently promised me an additional sum of \$25,000 with the understanding however that the amount shall be used for the purpose of securing increased accommodation for students."

At the meeting of the Board the recommendation of the Faculty's Committee referred to in the report, respecting the division of the academic year into two terms of nearly equal length, was adopted upon recommendation from the Trustees' Committee on the Curriculum. The Board also entrusted the building of the Dormitory to the Committee on Grounds and Buildings, and authorized the President to sign the necessary contracts after they shall have been approved by the Committee.

THE FELLOWSHIP SYSTEM IN PRINCETON.

One of the first acts of Dr. McCosh's administration in 1869-70 was the establishment of the Fellowship system in Princeton, his object being to raise the standard of scholarship in the four main departments into which the College was then divided. In so far as one of the chief functions of a college is to perpetuate its kind, we must candidly admit that at this time the intellectual activity of the College was not great—that is if we can justly estimate it by the number of graduates who were turning to purely literary or professional work, outside of the three leading professions. Of the 1302

graduates of the 1850-70 period, about forty-two are recorded¹ as having held Professorships, and a comparatively small number have become men of literary note. This was no doubt in part owing to the educational depression of the war period. Among the 1451 graduates of the next sixteen years, many of whom are very recently out of college and still in training as teachers, we find upwards of seventy college professors and a much larger number of teachers. This increase has been undoubtedly due to a complex of factors, chiefly, of course, to the rapid internal development of Princeton, especially in the scientific branches; in part to the general growth of American colleges and larger demand for teachers; but in no small measure to the successful working of the Fellowship system.

The system itself was a new departure in the colleges of this country, suggested by and an improvement upon, the permanent fellowship holdings in the English universities. Harvard was slightly in advance of Princeton, establishing three fellowships in 1868-9 and now offering fourteen. At Yale the first two fellowships were founded in 1873-5; there are three offered at present. There were two offered at Columbia in 1874², which number has now been increased to seven. The establishment of eight fellowships at Cornell is also comparatively recent. The opening of a large number (20) of University fellowships to graduates of any American college has been one of the most distinctive and successful features of the Johns Hopkins University since its foundation in 1876.

At Princeton, starting with four fellowships of \$600 each in 1869-70, as shown in the accompanying tables, the fellow-

¹ Triennial Catalogue of 1886, pp. 95-118.

² The Catalogue of this date speaks of these fellowships as recently founded. The earlier catalogues were not accessible to the writer.

ships have, since 1873, varied from six to ten. For the present year, eleven appointments have been made and the Fellows receive, in the aggregate, \$4,400. The system has thus become an important part of the superstructure of the College; it has been in effect for twenty years; altogether 130 Fellows have been appointed. We can fairly estimate its value by its results between 1870-86, and look at the record practically: have the fellowships fulfilled their purpose, has the past method of appointment and administration been the most effective, do these results justify an appeal for the extension of the system? These will be considered from a definite point of view — that the fellowship is entirely distinct from the Collegiate prize; the latter is a recognition of some result or degree of proficiency already reached by a student without reference to his future line of work. The fellowship is this and something more; it recognizes the ability and mental promise displayed in the quantity and quality of work accomplished and is awarded expressly to enable the student to continue in a special line of study or research.

A convenient distinction may be made between the Collegiate fellowships, which are awarded at graduation by competitive examination, and the University fellowships, which are awarded without examination to graduates of any American college.

THE COLLEGIATE FELLOWSHIPS.

The main fellowships of the former class since 1870, are the *Experimental Science*, awarded after examination in Physics, Geology and Chemistry; the *Mathematical*, in pure Mathematics; the *Classical*, in Greek and Latin languages, literature and philosophy; the *Mental Science*, in history of philosophy, psychology, and logic. To show fairly the results of these fellowships, a full exhibit is made. Of the sixty-

five fellows, twelve have entered the Law and eight the Ministry. Thirty have taken positions as college professors, tutors or instructors, and ten as principals and teachers in the schools, (now partly engaged in college instruction). All things considered — the difficulty of procuring positions as teachers which afford even a fair living, and the various special opportunities which arise in the Law and other professions—this is certainly a most encouraging report. The question arises, Have we had the maximum results? The answer to this depends upon our view of the objects of the fellowship; from one standpoint, — that they are designed to produce men of culture, irrespective of the vocation they enter,—those who know the present high position in various professions of the majority of the Fellows will give an affirmative. From another point of view — observing the large number of Fellows, among them many of the ablest, who after a year's study have entered immediately upon professional work very remotely related to their fellowship — we feel that in many instances the fellowship has been regarded simply as a prize instead of a grant given and accepted for a special educational purpose.

We cannot fairly judge the two *Boudinot Fellowships* by the same standard as the four above. While in name fellowships, they are in fact prizes too large when considered as such, and too small to support a Fellow in his year of resident or non-resident study after graduation. The records demonstrate this indisputably. Of the twenty-seven appointees to the *Historical and Modern Languages Fellowships* only six have gone abroad to study, while eight have remained in Princeton—the fact is that the remaining thirteen have simply accepted the \$250 grant as a prize, and immediately entered one of the leading professions or commercial life. The majority of the Fellows in History have

entered the law, and many of them occupy promising positions. Not one, to the writer's knowledge, has taken up the study of history. Of the Modern Language Boudinot Fellows three have taken temporary positions as tutors or teachers. Only one has made the subject his profession, Professor Henry A. Todd, Associate Professor of Modern Languages, Johns Hopkins University.

It must be kept in mind that there are comparatively few openings for Americans as teachers of the continental languages; also that the department of history has only recently been fully represented in the Faculty. Even under the present method of division of the Boudinot fund we may therefore look for increased results in the future. A comparison with the other fellowships shows the necessity of a grant sufficiently large to enable the college to require of the Fellows a year devoted exclusively to study, in Princeton or in a foreign University. It appears that better results would have followed from one fully endowed fellowship, than from two half endowed.

The *E. M. Biological Fellowship* has been so recently offered to undergraduates that only one appointee comes within the period we are considering. Mr. J. Warne Phillips '86, is now an Assistant in Comparative Anatomy in Princeton.

UNIVERSITY FELLOWSHIPS.

In 1877-8 the President and Faculty organized the Post Graduate courses of lectures, the beginning of the University development in Princeton, and a marked stimulus to the intellectual progress of the College, as shown by the large and increasing number of university students and increased interest in advanced work. At the same time the first University Fellows (upon the S. L. Fellowships) were appointed by election of the departments from among resident graduates. These

were followed by two, in one year, three and two in the succeeding years, E. M. Fellowships, and continued upon what will probably be a permanent footing in the present University Fellowships. Nine of the eleven Fellows thus appointed previous to 1886 have entered professional work, one as a high school teacher, five as college professors (in Princeton, Lake Forest University and Haverford), two as college instructors, one as State Geologist of Wyoming. The regulations governing the present appointment of the University Fellows embody an important advance in the Princeton system, already adopted at the Johns Hopkins, Harvard and Cornell. The fellowships are open to the graduates of any American College, they are distinctly for the encouragement of original research, upon the theory that the well equipped teacher of the present day must also be an investigator. Original research, as we all know, requires a special training. It is one thing to acquire knowledge, another to learn to impart it, a third to contribute to it. This three-fold talent is what is now looked for in the professional appointments of the best institutions. The election is thus made from men who have already pursued advanced courses of study and are presumably qualified for the higher discipline of original investigation. These fellowships are therefore designed to continue the work begun by the collegiate fellowships — they may be assigned to the same men — and will not materially increase the number of graduates entering professional study, but will certainly raise the standard of scholarship.

GROWTH OF THE EDUCATIONAL SPIRIT.

As already stated, among the graduates of the first sixteen years of Dr. McCosh's administration, upward of seventy appointments have been made to College and University Professorships in this country

and the Mission colleges of Syria, Japan and Turkey. Judging from the present list of lecturers, instructors and advanced students, who are now in the line of promotion, this number will be rapidly enlarged. Princeton has naturally filled many positions with her own graduates. The partial list is as follows:

<i>Colleges.</i>	<i>Number.</i>
Princeton	12.
Columbia College (Academic Department and Medical School)	3.
Johns Hopkins University	3.
Lake Forest University	2.
University of Kansas	2.
University of Minnesota	2.
Wesleyan University	2.
University of the City of New York	2.
Theological Seminaries of Princeton, Au- burn, Alleghany	4.
Miami University	3.
Colleges in Syria, Japan, Turkey	7.

In the following colleges, among others, single appointments to Professorships have been made:

Lehigh, Franklin and Marshall, Dickinson, Washington and Jefferson, Bryn Mawr, Haverford, Marietta, Wooster, Wabash, North Western University of Tennessee, Univ. of North Western Virginia, Iowa State Agricultural College, University of Montana, Washington Territory, University of Texas, Lincoln, Macalester, Amherst.

This summary, while it of necessity omits the collegiate instructors, and no less important body of teachers in the schools, enables us to form an estimate of the rapid rise of the educational spirit at Princeton and of the opportunities for a well-trained body of graduate teachers to extend the characteristics of our methods of teaching and government to different parts of the United States. This has a marked illustration in Miami University, which has recently called its President and three members of the Faculty from the younger generation of Princeton Alumni.

Twenty-eight of the above Professorships have been assigned to former holders of Fellowships; this number including the majority of the appointments of the first rank. Altogether about 40% of the Fellows have taken teaching as a profession.

MODIFICATION AND EXTENSION OF THE FELLOWSHIPS.

These facts show that the Collegiate system, as at present regulated, has already produced results which must fully repay the generous spirit of the founders and subscribers. Our past experience appears to show also that it may be well to consider the advisability of one or two changes in the regulations, with especial reference to the proposed extension of special and honor work, which will be open to undergraduates in the new curriculum. The suggestions are not to be understood as depreciating the past results in any sense. First, as to the system of appointment by competitive examination. Princeton is apparently the only college which has adopted this method, from the start, and our experience raises some doubt whether it is the best one. The ideal working of a Fellowship offered in a certain department, would certainly be, first, a direct stimulus to several of the abler men towards a higher standard of work, thus raising the general standard by the force of example and enthusiasm. Second, the selection of the man whose past work in quantity and quality gives the most promise for the future. We all know that these results, while often attained, are in a measure accidental under the present system. One, sometimes two men, announce that they intend to compete for a certain fellowship. Real competition often ceases before the examination, for about one-half the fellowships are awarded to single applicants. Again, where there is competition, ability cannot

always be reckoned in percentage, and in some cases the appointment of unpromising men has been forced upon the departments against their better judgment. It may be said, why does competition in a department cease when the examination is upon subjects which would be useful to the student—even if unsuccessful? Here is the crucial defect, the examination is of necessity special, covering three or four divisions only of an extensive field. On the other hand the competitive system has its advantages. It is well for the College to consider whether the present method of appointment should not be replaced by that of election of the departments, after a careful comparison of the whole field of work (touching the subject of the fellowship), covered by the candidates in the Junior and Senior years. This would secure a real competition, and the unsuccessful but deserving candidates could be rewarded by special honors. In most cases the selection of the best man would not be a very difficult matter; if however the members of a department should not agree, an examination could be held.

There is another change suggested by the record of the Fellows, which is perhaps more debatable than the above. Besides the scholarships, upwards of \$2,200 (or \$1,700 excluding the Stinneke Prize) are paid annually in prizes as a stimulus to the general class who are preparing for the leading professions and commercial life. And it would seem that the special purpose of the fellowship, as a grant to induce students to enter the unpromising—from a pecuniary point of view—field of teaching or investigation is often frustrated, if the future plans of the candidates are not taken into consideration in the appointments. In the class of 1876, for example, every Fellow but one, after a year's study abroad, entered Law practice or the Ministry, when in the same class there were many others, who without any collegiate

encouragement have subsequently distinguished themselves in teaching and research. This could be regulated by a special provision, more in the nature of an understanding than a rule of rigid application, by no means to exclude Fellows from the leading professions—but to send into these professions men trained to contribute to them as writers on professional subjects. A Fellow in Biology, for example, might well enter Medicine on its scientific side.

The spirit of these suggested changes is that candidates for collegiate fellowships, as for special honors, shall have pursued with credit certain departmental courses; their application, made in writing early in Senior year, shall indicate their intention to devote themselves to teaching or investigation in some branch of Philosophy including Theology, Literature or Science; their appointments shall be by vote of the Faculty upon recommendation of the Departments.

There is great need for further extension of this system. The University plan cannot advance very far without the support of increased University Fellowships, which have been demonstrated such a complete success here and at Johns Hopkins University. We require a Collegiate Fellowship in each of the groups of studies which a student may select in preparation for his B. A. or B. S. Degree. The Classical Fellowship has the first claim for endowment. In Science, we greatly need fellowships in Chemistry and Astronomy, the latter could probably be well made of the University class and would render much more effective the abundant facilities Princeton can offer to students in this branch. An effort should be made to increase the Boudinot fund, so that it can support two Fellows. Among the University Fellowships, Physics, History and Mental Science, are subjects in which the College is particularly well equipped for advanced work.

COLLEGIATE FELLOWSHIPS.

CLASS OF	EXP. SCIENCE FELLOWS.	MATHEMATICAL FELLOWS.	CLASSICAL FELLOWS.	MENTAL SCIENCE FELLOWS.
'70	Wm. H. Miller. (Prizeman.) Princeton.	<i>Theod. B. Pryor.</i> Cambridge.	Geo. H. Hooper. Berlin. Teacher, Classics.	Wm. D. Thomas. Princeton. Minister.
'71	John C. Pennington. Columbia Sch. Mines. Physician.	Alex. G. VanCleve. Princeton. Business.	Benj. J. Lassiter. Berlin. Teacher. Minister.	Charles S. Barrett. Edinboro'. Minister.
'72	Albert Williams. Princeton. Civil Service, Census Bureau. Pres. Mich. Mining Col- lege.*	James A. Lyon. Princeton. Prof. Highland Univ., Kans. Prof. Phys. Science, Wash. & Jeff. Coll. Pa. Prof. Nat. Science N. W. Univ. Tennessee.	Winfred R. Martin. Germany. Teacher High School, Jersey City, Classics. Teacher, High School, Hartford. s. Tübingen.	Leigh R. Smith. Princeton. Minister.
'73	Walt. B. Devereux. Princeton, Columbia Sch. Mines. Mining Engineering.	No appointment.	<i>David Scott, Jr.</i> Princeton. Germany. Teacher. Missionary, Persia.	John P. K. Bryan. Berlin. Lawyer.
'74	Alex. R. Whitehill. Freiberg, Sax. State Geologist, Nevada. Prof. Chemistry, Univ. West Virginia.	Geo. Henry Ferris. Princeton. Tutor Math. Princeton. Missionary.	Andrew F. West. Princeton. Cincinnati High School, Classics. Princ. Morrist. Acad., Morristown, N. J. Prof. Latin, Princeton.	Sam'l R. Winans. Princeton. Prof. Greek, Princeton.
'75	<i>Ells. E. Hunt.</i> Princeton, Berlin. Vienna.	G. Bruce Halstead. Princeton. Math. Fellow Johns Hopkins. Instructor in Princeton. Prof. Math. in Univ. Texas.*	Charles R. Williams. Princeton. Leipsic. Prof. Greek, Lake For- est Univ., Ill. Assoc'd Press Bureau, New York.	Fred'k B. VanVorst. Princeton. Fellow, Johns Hopkins. Lawyer. Archibald Alexander. Berlin. Prof. Philosophy and Ethics. Columbia College.
'76	David B. Jones. Leipsic, Berlin. Lawyer.	Chandler W. Riker. Leipsic. Lawyer.	Edward C. Evans. Oxford. Minister.	Thos. D. Jones. Leipsic. Lawyer.
'77	Wm. B. Scott. Princeton. Heidelberg. Prof. Geology, Prince- ton.	Geo. H. Gowdy. Princeton.	John H. Westcott. Leipsic. Lawyer. Tutor, Latin, Princeton. Assist. Prof. Modern Lang. Princeton.	Alex. T. Ormond. Princeton. Prof. Mental Science. Univ. of Minnesota. Prof. Mental Science and Logic, Princeton.
'78	Alb. D. Anderson. Princeton. Lawyer.	Isaac H. Hess. Leipsic. Lawyer. Teacher.	Robt. A. Mayo. Leipsic. Minister.	David Stewart. Princeton. Lawyer.

COLLEGIATE FELLOWSHIPS.

CLASS OF	EXP. SCIENCE FELLOWS.	MATHEMATICAL FELLOWS.	CLASSICAL FELLOWS.	MENTAL SCIENCE FELLOWS.
'79	No appointment.	Fletcher Durell. Princeton. Prof. Math. Dickinson Coll., Pa.	John D. Davis. Bonn. Leipsic. Prof. Hebrew, Prince- ton Theol. Sem.	P. Joseph Hamilton. Princeton. Lawyer.
'80	Henry B. Fine. Princeton. Leipsic. Prof. Mathematics, Princeton.	Charles W. Scribner. Princeton. Stevens. Prof. Mechanical En- gineering, in State Mech'l and Agric. Coll., Ames, Iowa.	C. A. R. Janvier. Princeton. Missionary.	No appointment.
'81	Arthur L. Kimball. Princeton. Fellow, Johns Hopkins. Assoc. Prof. Physics. Johns Hopkins Univ.	Charles C. Robbins. Princeton. Tutor Math., Princeton. Lawyer.	Wm. A. Robinson. Leipsic. Prof. Greek, Marietta College. Prof. Greek, Lehigh Univ., Pa.	A. C. Armstrong. Princeton. Berlin. Instructor History, Princeton. Prof. Philosophy, Wes- leyan University.
'82	Henry Crew. Princeton. Fellow and Assoc., Johns Hop- kins. Prof. Physics. Haverford Coll.	John G. Hibben. Leipsic. Tutor Math., Princeton. Minister.	Geo. P. Pierson. Princeton. Prof. Union College, Tokio.	Thomas Peebles. Princeton. Prof. Mental Science, Univ. Minnesota. Lawyer.
'83	Albert P. Carman. Princeton. Tutor Math., Princeton. s. Berlin.	Henry M. Landis. Berlin. Teacher in German Theol. Seminary. Prof. Eccles. History. Union College, Tokio, Japan.	Benj. W. Mitchell. Princeton. Principal Academy. Pittsburgh.	John G. Murdoch. Princeton. Teacher.
'84	Alex. S. Rowland. Princeton. Cambridge. M't'g. Pottery.*	Alex. G. Reeves. Princeton. Columbia Law School, 1st prizeman. Instructor Columbia Law School.	Henry B. Gayley. Princeton. Teacher. Lawyer.	James M. Baldwin. Princeton. Berlin. Prof. Philosophy, Lake Forest University.
'85	Geo. B. Durell. Princeton. Teacher, Uplands, Pa. Business.	Henry D. Thompson. Princeton. Fellow, Johns Hopkins. Göttingen. Tutor Math., Princeton.	Monroe Crawford. Göttingen. Lawyer.	J. Harlan Cleveland. Berlin. Lawyer.
'86	Taylor Reed. Princeton. Tutor Math., Princeton, Asst. Astronomy, Princeton.	James H. Boyd. Princeton. Prof. Math., Macalester Coll., Minnesota.	Geo. B. Roddy. Princeton. Tutor, Latin, Princeton.	Edw. D. Miller. Princeton. Minister.

On second line the Fellow's residence as a student.
Fellows deceased, printed in *Italics*.

* indicates present occupation not ascertained.

On last line present occupation.

s., indicates present residence as a student.

COLLEGIATE FELLOWSHIPS.

APPOINTMENTS MADE AT GRADUATION BY COMPETITIVE EXAMINATION.

<i>Title.</i>	<i>Foundation.</i>
<i>The Chancellor Green Mental Science Fellowship.</i> \$500.	Announced in 1869. Subscribed from 1870-77, and endowed (\$10,000) in 1878 by Chancellor Henry W. Green of New Jersey.
<i>The Class of 1860 Experimental Science Fellowship.</i> \$600.	Announced as a prize of \$100 to Class of '70, endowed (\$10,000) in 1870 by the Class of 1860. The interest lapsing temporarily, the fellowship was subscribed or honorary appointments were made in the Classes of '77 to '80.
<i>The Marquand Classical Fellowship.*</i> \$600.	Announced as a Fellowship to Class of '70. Subscribed from 1870-81, by Henry G. Marquand, Esq., of New York.
<i>The Classical Fellowship.</i>	Announced in 1884 to Class of '85. Subscribed anonymously, in various amounts, to date. No present endowment.
<i>The Jay Cooke Mathematical Fellowship.*</i> \$600.	Announced in 1869 to Class of '70. Subscribed for two years by Jay Cooke, Esq., of Philadelphia. Lapsed for Class of '73.
<i>The J. S. K. Mathematical Fellowship.</i> \$600.	Announced in 1873 to Class of '74, and endowed \$10,000 by J. S. K., of New York.
<i>The Boudinot Historical Fellowship.</i> \$200.	Announced at Commencement 1869. (\$450.) Three appointments made for following year. Announced, as at present, in 1871 for Class of '72. Endowed in 1871 by Dr. Elias Boudinot, of New Jersey.
<i>The Boudinot Modern Language Fellowship.</i> \$250.	
<i>The E. M. Biological Fellowship.</i> \$200.	Announced in 1882 to Class of '83. Endowed by E. M. Museum Fund, with privilege of Table in U. S. Fish Commission Laboratory at Wood's Holl. The interest has lapsed temporarily since 1886.

UNIVERSITY FELLOWSHIPS.

APPOINTMENTS MADE AFTER GRADUATION BY ELECTION OF THE FACULTY.

A.—Open to Graduates of Princeton only.

<i>The S. L. Fellowships.*</i>	Announced in 1887 for Graduate Students in Mental or Social Science. Each of \$600. Two appointments made from Class of '77 in year 1877-8. Three appointments made from Classes of '77-8 in year 1878-9.
<i>The W. S. Ward Fellowship in Economic Geology.*</i> \$600.	Announced in 1881 to Class of '82. Open to graduates and undergraduates by examination. Appointments made for three years in Classes '81, '82. Subscribed by W. S. Ward, Esq., of Denver, Col.
<i>The E. M. Fellowships in Biology, Geology, and Physical Science.*</i> \$600.	One special appointment from the Class of '77 made in 1878-9. Two in 1879-80. Two in 1880-83. Each of \$600. Subscribed from E. M. Museum Fund.

B.—Open to Graduates of Princeton and other Colleges.

<i>The Class of 1877 University Fellowship in Biology.</i> \$400.	Announced in 1887. Subscribed from 1887 to 1892, five years, by the Class of 1877.
<i>The South East Club University Fellowship in Social Science.</i> \$500.	Announced in 1887. Subscribed as above by members of the South East Club.
<i>The University Fellowship in English.</i> \$400.	Announced in 1887. Subscribed, as above, anonymously.
<i>The University Fellowship in Archaeology.</i> \$400.	A special appointment made for 1889. Announced for the coming year. Subscribed anonymously.

* These fellowships, after extending over some years, were discontinued or replaced by others having a similar object.

It is hoped that this review of what the fellowships have already accomplished, will show our past benefactors that they have materially advanced the cause of higher education not only in Princeton but indirectly in this country, and will encourage the rapid extension of endowments.

HENRY F. OSBORN.

ORIGINAL CONTRIBUTIONS.

DR. McCOSH'S LECTURES ON FIRST AND FUNDAMENTAL TRUTHS.

Dr. McCosh's Lectures on FIRST AND FUNDAMENTAL TRUTHS, which were delivered to Seniors and graduates, have been published by the Scribners. A number of copies have been sent to India, where two of Dr. McCosh's works are used as textbooks in the University of Calcutta and other colleges. Some copies have been sent to Berlin, where Dr. Stuckenberg will distribute them to young thinkers who know English, and are inclined to turn away from the Forms of Kant towards Realism. Macmillan, the great London publisher, has bought five hundred copies. Dr. McCosh has been delivering a second course of Lectures on the Tests of Truth. These will be re-delivered in the College at Delaware, Ohio, one of the largest of the Methodist Colleges, and published by that College in the Spring. It has been shown that there is no one criterion which will test all truth. Dr. McCosh holds that there can now be given tests of all the *various kinds of truth*. He gives the tests of First and Fundamental Truth, viz.: Self-evidence, Necessity and Catholicity. Then he gives the tests of Reasoned Truths, especially of Terms and Propositions, these being the laws of Logic, in Reasoning the Syllogism. Thirdly, he turns to Scattered Facts in nature as gathered into laws, and

finds tests in an amended Form of the Canons of Induction. Fourthly, he explains the Joint Inductive and Deductive Method, Hypotheses and Verification of Inductions. In the last Lecture he treats of Testimony, and in opposition to *Elsmerism* show that it is capable of establishing Supernatural Truth. The little work, when published, will be a treatise on what Kant calls Applied Logic, and undermines Agnosticism.

PROFESSOR MORLEY AND RICHARD DE BURY'S PHILOBIBLON.

By ANDREW F. WEST,

PROFESSOR OF LATIN AND PEDAGOGICS.

Professor Henry Morley of University College, London, devotes most of the third chapter in the recently published fourth volume of his "English Writers" to an account of Richard de Bury and his beautiful Latin treatise the "Philobiblon." While Professor Morley's literary estimate of the book does not go astray, it is a matter of regret that so many inaccuracies of textual and historical detail mar his account.

I have noticed the following:

1. "He was born in the year 1281," with foot note "M. Cocheris says 1287."

Our sole authority for Richard de Bury's birth date is the colophon of the Philobiblon which states that his fifty-eighth year was exactly finished (*praeclise completo*) on January 24th, 1344. This was, of course according to the old reckoning, and corresponds to February 1st, 1345, if reduced to strict modern reckoning. This fixes the date of his birth on January 24th, 1286 (O. S.), or in our reckoning February 1st, 1287.

2. By taking a hopelessly discredited Latin text as the basis for a "miniature copy" in English, which shall ascribe to the Philobiblon "no turn of thought or phrase that is not to be found in the original," (p. 46), a number of errors and

infelicities necessarily follow. I cite some of these:

"A two legged beast, called woman," (p. 48), translates accurately *bestia bipedalis*, *scilicet mulier*. But *scilicet mulier* is no part of the original text. It is a gloss of a late copyist, after the fashion of mediæval slurs at woman.

"On each side the dirt clings to us" is for *utrinque lateris sustinemus putredinem*. *Lateris* is not only incorrect but spoils the sense of the passage. The proper word is *Lazari*.

"A bull-necked youth," (p. 53), is strong but over-strong for *juvenem cervicosum*. *Cervicosus* is a mediæval word coined out of *duræ cervicis*, taken from the Bible phrase *populus duræ cervicis*, "a stiff-necked people" (Exodus xxxii. 9), and *cervicosus* in the same sense occurs in *cum cervicosum populum esse ad Deum arguit* in a comment of Hilary (see Paucker, suppl. Lex. Lat. I. 70), and nowhere else in any other sense so far as I can ascertain.

"A nail like a giant's," (p. 53), is of course for the incorrect *unguem giganti simillimum*. *Giganti* is a mistake for *gagati*, and the sense is "a nail black as jet."

"Never ceases to bow-wow at his companions" is rather grotesque for *latrare* when applied to the quarrelsome talk of a mediæval tyro of a scholar,—the same "bull-necked" youth, with a nail "like a giant's" and "bow-wow" at his comrades; quite an appalling literary portrait even in "miniature."

3. But the really serious errors are in the foot note (p. 55), which purports to give an account of the manuscripts and printed editions. It is both very imperfect and inaccurate.

There are said to be two manuscripts in the British Museum, two in Oxford, one in Durham and others in "a few churches in England, besides those upon the Continent." There are seven in the British Museum and nine at Oxford. There is

also, it is true, one at Durham. Besides these there are three at Cambridge and two in private hands. If there are any others in England, "in a few churches" or anywhere else, it is quite unknown, I am sure, to any student of the Philobiblon or to English librarians. In regard to the printed editions Professor Morley repeats the common error as to there being two editions printed in Paris in the year 1500. There was only one edition of that year, and the mistake is easily understood as soon as the edition is inspected. The statement that there is a Paris edition of 1500 by Ascensius and another by Jean Petit is explained as soon as the fact is stated that Ascensius edited and Jean Petit printed the same edition, and that the error is probably traceable to a misunderstanding of the word *secundum* in the printer's note at the end.

The Oxford edition of 1599 is not then the "fifth edition," as Professor Morley states, but the fourth, for the one indivisible Paris edition of 1500 was the third edition and immediate predecessor of that of Oxford.

"From three MSS. in the Imperial Library, Paris, M. Hippolyte Cocheris has collated the best modern library edition." Without here discussing the value of M. Cocheris' labors, which are worthless so far as the text is concerned, I only remark that M. Cocheris did not in any true sense "collate" his edition from manuscripts. He examined these three Paris manuscripts (Nos. 15168, 3352c, and 2454 of the *fonds Latin* in the present National Library) and recorded their variations from a reprint of the Philobiblon with considerable inaccuracy, and then reprinted the reprint with his "collation" below, without using them to edit the text in any way.

The editions which receive no mention whatever are the Goldast series of 1610, 1614, 1673, and 1703.

Such errors as these could be overlooked if no means of correcting them were avail-

able. But the various bibliographical notices supplied the means for correcting many of the errors in regard to manuscripts and printed editions, and the printed editions themselves were all available both in the British Museum and at the Bodleian, while the labors of Mr. Ernest C. Thomas have been publicly known for about four years in London, and ought to have been considered.

*NOTE ON THE CONSTRUCTIONS OF
ELEMENTARY GEOMETRY.*

By H. B. FINE,
ASSISTANT PROFESSOR OF MATHEMATICS.

The elementary geometry restricts itself in its constructions to the use of but two instruments, the ungraduated straight-edge and the compasses. By aid of the straight-edge a right line can be drawn to connect any two points, or a given terminated right line can be indefinitely produced; and with the compasses a circle of any given radius can be described about any given point as centre, or the end points of a given line be transferred from one part of the plane to another.

In most of the constructions as commonly performed both these instruments are brought into requisition. In particular, points are determined not only by the intersection of circles with circles, but of right lines with right lines and of right lines with circles. The following constructions may therefore be of interest as showing that all the problems of elementary geometry, so far as they have to do with the determining of points, may be solved by use of the compasses only.

PRELIMINARY CONSTRUCTIONS.

1. *To construct the end points of double a right line of which the end points are given.*

With the given line as radius describe a circle and in it determine the angular points A, B, C, D, E, F, of a regular hexa-

gon. A side of the hexagon being equal to the radius of the circle, the construction requires the compasses only. The distance between every pair of opposite angular points, as A, D, is the diameter of the circle, or twice the given line.

By a repetition of this construction the end points of any multiple of a given right line may be found.

2. *To construct the mid-point of a right line of which the end points are given.*

Construct, by 1, A, B, the end points of double the line.

Describe a circle with centre B and the given line for radius, and also a second circle with centre A and radius AB. Let these circles intersect in C and D.

Describe then a second pair of circles, both with the given line for radius, the one about C as centre, the other about D. These circles will intersect at B and at a second point, E, which is the mid-point required.

3. *To divide a circle of given radius OA into quadrants.*

Let A, B, C, D, E, F be the angular points of the regular inscribed hexagon. Then $AC = OA\sqrt{3}$.

Find the mid-point of AC (by 2) and taking this point as centre, describe the circle having AC for diameter.

Let G be the point where this circle is cut by a circle of radius OA described about A as centre. Then $GC = OA\sqrt{2}$. But $OA\sqrt{2}$ is the side of the inscribed square.

4. *To construct the end points of a third proportional to two right lines, given by their end points.*

Let a be the first line, A, B its end points; and let b be the second line.

If $a > b$, describe a circle on A B as diameter and a second circle of radius b about A as centre; let C be one of the intersections of these circles.

Again describe a second pair of circles the one on AC, the other on BC as diameter

and let the two intersect at D. AD is a third proportional to a and b .

If $a < b$, construct (by 1) a multiple aa of a , which is greater than b ; and by the construction just given find a third proportional to aa and b . The a^{th} multiple of this line will be the required third proportional to a and b .

FUNDAMENTAL CONSTRUCTIONS.

I. *To construct the end points of a line which is the sum or difference of the two right lines a and b given by their end points.*

Suppose a to be the greater line (the case $a=b$ having been already disposed of in 1) and let A and B be its end points.

Describe a circle on AB as diameter (by 3) and let it be cut at C by a circle of radius b and centre B; $AC=\sqrt{a^2-b^2}$.

Next construct $DE=a\sqrt{2}$ (by 3) and a circle on DE as diameter. And let this circle be cut at F by a circle of radius $\sqrt{a^2-b^2}$ with centre at E; $DF=\sqrt{a^2+b^2}$.

Finally about A as centre describe a circle of radius $\sqrt{a^2+b^2}$ and cutting at G and H the circle of radius b already described about B. A circle with centre at G or H and radius $b\sqrt{2}$ cuts the circle about B in the points required.

II. *To construct the point in which two right lines, given by their end points, or the lines produced, intersect.*

Let AB, CD be the given lines.

Describe circles on BC, BD as diameters (by 3). They intersect at E, the foot of the perpendicular from B to CD.

By a similar construction find F, the foot of the perpendicular from E to AB.

Find (by 4) a third proportional to BF and FE; the end point of the sum of BF and this line (obtained by I) is the point required.

The construction fails only when AB and CD are parallel.

III. *To construct the points, if real, where a right line given by its end points or the line produced cuts a given circle.*

Let AB be the given line, C the centre of the given circle and CX its radius.

By constructions already given find D, the foot of the perpendicular from C to AB and $FD=\sqrt{CX^2-CD^2}$.

The points required are the end points of $AD+FD$ and $AD-FD$ respectively.

BOOK REVIEWS.

GOSPEL SERMONS. By JAMES MCCOSH, D.D., LL.D., Litt.D., Ex-President of Princeton College. New York: Robert Carter & Brothers, 1888. 12 mo., pp. 336.

It has been all along one of the blessings of the students of Princeton College, that those who taught them philosophy could also preach to them the wisdom which is not of this world, and show in their life and teaching alike that as much as they valued philosophy they placed the gospel of Jesus Christ above it. Dr. McCosh publishes this volume with the avowed purpose of discovering this to the public; and therefore has selected just those of his sermons for inclusion in it which seem to him to "proclaim most clearly the way of salvation." The special note of the collection is, therefore, not philosophical depth or theological grasp, but the simplicity of the truth. The subjects that are chosen are the primary gospel themes of faith and repentance, the life in Christ on this side and the life with Christ on the other side of the grave: and the treatment that is accorded to them is broad rather than detailed, practical rather than theological, elementary rather than profound. The hand of the philosopher is seen only in a certain breadth of conception, in an occasional care in definition, in an infrequent and unaffected allusion to a name or a controversy, and especially in a fulness of analysis of motive or character. The style is characterized by a strong biblical flavor in the language and

a fine figurative couching of the thought, which unite in a frequently occurring figurative use of incidents from Bible history which is very striking. Dr. McCosh himself tells us what he judges to be the style of preaching, "the most fitted to advance the kingdom of God" (p. 236). "It is preaching founded on scripture, that speaks of Christ, and speaks to all,—to rich and poor, to Greek and barbarian, to old and young. . . . Old Horace felt it to be a delight to sing *pueris et virginibus*; and depend upon it, that is the best preaching, and the most popular in the end, which addresses the father and the daughter, the mother and the son, the mistress and the maid, the unlearned as well as the learned." This is a fair description of his own sermons.

As we have read these simple, sincere discourses and have seen reflected in them the heart of the pastor busied with his flock, we have thought that some of the secret of Dr. McCosh's philosophical wholesomeness was uncovered by them. The query suggests itself whether it might not be well to force all philosophers and especially all psychologists to do pastoral work, that they may come to know man and thus be saved from crude imputation of a too-often warped and one-sided personality to the whole race. Most act as if they themselves know what is in man and need not that any should testify to them concerning man: though this has been the prerogative of only One Man that has ever lived on earth. The pastor, by coming to know the inmost life of others and to enter sympathetically into their most intimate feelings, obtains a key, valuable beyond all price to him who can skill to use it, for the unlocking of the mysteries of human nature within himself.

BENJAMIN B. WARFIELD.

FIRST AND FUNDAMENTAL TRUTHS, BEING A TREATISE ON METAPHYSICS. By James McCosh, D.D., LL.D., LITT.D. 1 vol. 12mo. pp. X, 358. New York. Charles Scribner's Sons. 1889.

The aim of this handsome volume, as the title indicates, is to elaborate and defend those primary intuitions of the mind for which Dr. McCosh has been contending all his life. Starting with the Aristotelian conception of Metaphysics as the science of First and Fundamental Truths the author thinks that the time has come when this science "may be made as clear and satisfactory as Logic, the science of discursive truth, has been since the days of Aristotle."

In pursuance of this intention the treatise opens with a general view of primitive principles; then in the main body of the work enters into a more particular examination of these principles and closes with the application of intuitive principles to the questions of knowledge and being, and also to the special spheres of various sciences. Our limits here will permit only the briefest possible review of the principal topics of each division. Part First considers the nature of First Truths in their threefold aspects of primitive cognitions, regulative principles and generalized maxims or laws. They operate at first spontaneously below consciousness, giving rise to singular judgments which are afterwards generalized into maxims through experience and reflection. The criteria of First Truths are the primary, secondary and tertiary tests of self-evidence, necessity and catholicity. Certain erroneous views of intuitions are then exposed and this part of the discussion closes with a chapter on the legitimate use of first principles.

In Part Second primary truths are classified into intuitive cognitions, beliefs and judgments. The first embrace our primary knowledge of body and spirit, of substance,

property, being, extension, number, motion and power. They furnish the original data on which all knowledge rests and with which all proof must begin. Primitive beliefs arise in connection with primitive cognitions, but go beyond them. Then follows a discussion of the primitive convictions which cluster around our ideas of space, time and the infinite, closing with a chapter on the extent, tests and power of our native beliefs.

Primitive judgments are formed from our primitive cognitions and beliefs. They arise in connection with the apprehension of certain primary relations such as identity and difference, whole and parts, resemblance, space, time, quantity, active property, cause and effect. To a critical exposition of these relations and the judgments founded on them several following chapters are devoted.

Book IV. of Part Second is devoted to a consideration of the primitive moral intuitions which are found to share with the intellectual intuitions in the threefold aspects and also to be amenable to the same threefold tests of validity. Several chapters are then given to the elucidation of "the fundamental principles involved in morality," the leading topics being, virtue, conscience, obligation, moral good, error and sin, the will, freedom and the relation of the moral end and happiness. Throughout the volume the author's contention is that there are certain fundamental principles or first truths lying at the basis of both the intellectual and moral life of man which it is the principal business of the metaphysician to unfold, classify and critically test and examine.

Part Third treats of the applications of fundamental principles, first to the science of Metaphysics itself, and secondly to various special sciences. Metaphysics in the broad sense embraces both Gnosiology or the science of knowledge and Ontology or the science of the ultimate principles

of being. After a preliminary chapter on fundamental truth as affected by evolution, such special problems of Gnosiology as the nature and limits of knowledge and ideas, the relation of intuition and experience, and the necessity attached to primary convictions are taken up and treated in successive chapters. The section on Ontology discusses such weighty topics as knowing and being, idealism, scepticism and agnosticism, and concludes with supplementary notices of various metaphysical theories in modern philosophy.

The closing chapters treat of the metaphysical elements in the sciences of Physics, Formal Logic, Mathematics, Ethics and Theology. Not the least interesting or valuable feature of the treatise are the elaborate historical and critical notices which are introduced in small print at the close of all the leading discussions.

A simple list of topics is sufficient to indicate the comprehensive character of the treatise. It is needless to say that it combines both clearness and profundity of thought, and that its style presents all those qualities which have distinguished its author among contemporary writers in philosophy. It is full of the vintage of ripe scholarship and is in every respect a worthy "cope-stone" to Dr. McCosh's work in philosophy.

A. T. ORMOND.

A TEXT-BOOK OF GENERAL ASTRONOMY for Colleges and Scientific Schools. By Charles A. Young, Ph.D., LL.D., Professor of Astronomy in the College of New Jersey, (Princeton). Boston, U. S. A., and London: Ginn and Company, Publishers. 1888.

The author's aim in the preparation of this book was to present such a course of reading in the science of Astronomy as he believed should be taken by every liberally educated person. It is necessarily neither

a manual of Practical Astronomy, nor a severely mathematical discussion of Mechanical Astronomy. The author has not, however, allowed himself to be restricted in the material of which he makes use, and his book offers an extremely complete view of the whole field of General Astronomy. This result is accomplished by omitting, in the portions of the book which treat of astronomical instruments, of methods of observation, and of the theory of gravitation, all the demonstrations which involve any but the most elementary mathematical knowledge and supplying their places by references to other works where these demonstrations may be found, and by clear statements of their results. The discussion contained in the chapter on Central Forces is the best example that can be cited from the book of this peculiarity in the author's method. In it, after the assumption, by reference to other works, of the main propositions in the theory of Central Forces, he has given an account of all the most important facts connected with the motions of bodies in orbits, and so explained them by the help of excellent diagrams, that they cannot fail to be intelligible and interesting, even to the reader whose mathematical discipline has been long forgotten.

The use of what may be called the "historical" method of presentation, in distinction from the "dogmatic" method is also a marked feature of the book, and is one which permits the introduction of a large amount of interesting and valuable matter which ordinarily finds no place in a text-book.

The book under discussion is essentially different in its style from others on the same subject. It is very difficult to write a text-book on an exact science or on a science which requires the presentation of a large number of disconnected facts without making it dry and dull. On the other

hand, the so-called "popular" account of a science is detestable. The author has succeeded in avoiding both extremes. The book is complete, accurate, and thoroughly scientific in its tone. It is not filled up with irrelevant matter. And yet it is so written that it sustains the interest and attention of the reader to the end. This result is accomplished partly by the way in which the author has selected and arranged his material, partly by his use of a literary style which allows his personality to appear far more than is usual in scientific text-book writing. The book appears, as many of the "lectures" on scientific subjects do not, as if it were a report of a series of lectures in which the lecturer did not waste words and where he yet allowed himself the liberty of an occasional departure from the formal recital of facts, in order to establish that feeling of personal relationship between himself and his hearers, which is so essential to sustained interest.

As might be expected, from the direction of the author's own investigations, special attention is given to the problems of Astronomical Physics. In this extensive field, in which are so many matters still under discussion, the author has not felt bound to restrict himself to those topics upon which there is substantial agreement, but has freely introduced and discussed matters which are still controverted. Among these may be noted the cause of sunspots, p. 189, Mr. Lockyer's views upon the dissociation of elements in the sun, p. 199, the reversing layer, p. 200, the origin of the asteroids, p. 343, intra-mercurial planets, p. 344, the photographic observations of transits of Venus, p. 386, the structure of comets pp. 406, 416, the origin of comets, p. 419, Mr. Lockyer's collision theory of the origin of variable stars, p. 484. Matter of this sort, the liberal references that are made to the history of astronomy, and the frequent cita-

tion of the results of the author's own study give the book a character quite distinct from that of the ordinary text-book. The order of the subjects discussed is that usually adopted in text-books of Astronomy. General definitions, descriptions of astronomical instruments and methods of observation occupy the first part of the book. The earth and the moon in their physical and astronomical bearings, are discussed. Two chapters follow, devoted to the physical characteristics of the sun. After the discussion of eclipses, there follow the chapters, already referred to, on Central Forces, which are preliminary to the account of the planetary system. Then follows the account of the planets themselves, and, after a chapter on the determination of the sun's distance, which could not be introduced until the motions of the planets were understood, come the accounts of comets, of meteors, and of the fixed stars. The book has an appendix containing tables of astronomical data, and a very complete index. The diagrams and illustrations are excellent.

W. F. MAGIE.

SUMMARIES OF PAPERS READ BEFORE SCIENTIFIC SOCIETIES.

ON SCIENTIFIC METHOD IN THE STUDY OF ART.

By ALLAN MARQUAND.

PROFESSOR OF THE HISTORY OF ART.

Various unscientific methods have more or less influence in the study of works of art. Of these we may mention the mystical method, which supposes an inherent mystery in works of art and leads to the establishment of a dogmatic, artistic priesthood. There is no such mystery in the subject. A second unscientific method imports the distinctions of philosophy to

the domain of art study, confusing the subject in the discussions concerning the real and the ideal, the absolute and its manifestation, instead of furthering our knowledge of art. A third method of approach, which has been as great a hindrance as a help, is the literary view which treats artistic phenomena as languages and subjects them to grammatical, philological and literary forms of thought. Such slavery is unnatural. Art must be studied independently and in its products. In its widest sense art includes all things that are put together, formed or made, and is opposed to chaos. In a narrower sense it includes only the things or combination of things made by man to excite psychic feeling through sense-impressions. It is here distinguished from non-human, insensible and purely industrial production. Its field and objects are as definite as those in other sciences of observation. The arts which appeal to us through the sense of sight alone are sufficiently numerous and varied to constitute a broad field for scientific investigation. They embrace the graphic arts, such as drawing, engraving, weaving, &c.; the plastic arts, as marble, stone, wood and ivory carving, ceramics, bronzes, wrought or hammered metals, &c., the architectonic arts, as architecture; the chromatic arts, including light and shade, the juxtaposition of colored substances as in the various kinds of mosaics and the mingling of colors as in painting. The scientific method is to-day being applied in establishing in these various classes a series of forms indicating the historic development of the art, the scientific imagination is reconstructing ancient monuments, scientific prediction is leading to important archæological discoveries, while comparative and statistical methods of enquiry are constantly enlarging our knowledge. Mathematical accuracy is being required in new directions and mathematical formulæ finding new

lines of application. An interesting comparison might be drawn between the present state of archæological and of biological science. Prehistoric Archæology finds its analogue in Palæontology, Historic Art in Morphology, the Comparative Study of Art in Comparative Morphology, while the study of the artistic products of children corresponds to Embryology and the interpretation of art to Physiology.

[Abstract of paper read before the *Philosophical Club*, Jan. 20th, 1889.]

HUGUENOT INDUSTRIES IN AMERICA.

By ALLAN MARQUAND,

PROFESSOR OF THE HISTORY OF ART.

The attempts made by Admiral Coligny in the sixteenth century to establish colonies of French Protestants in America were stimulated by the idea of expanding French commerce, but proved unsuccessful. In the early seventeenth century Huguenot captains, pilots and merchants in the West Indies show themselves superior to the Catholics and secure the positions of importance in the West India Company. Similar superiority was exhibited by the Huguenot traders in the gulf of St. Lawrence, but was repressed by jesuitical legislation in France. Even before the Revocation of the Edict of Nantes the Huguenots attempted to establish their industries in America. The culture of the vine was undertaken with marked success in Virginia in 1610, and in the Carolinas somewhat later. In 1683 William Penn urged upon the Free Society of Traders in London the encouragement in this country of vine culture and linen manufactures under Huguenot assistance. His vineyard in Philadelphia was not a permanent success. The finer industries of the Huguenots, such as the manufactures of silks, velvets and laces, could not succeed in this country for a hundred years after the Revocation, for such reasons as the unset-

tled character of the country, the austerity of manners and sumptuary laws in New England, the absorbingly commercial character of the seaport towns. The weavers who came to this country at this time became agriculturists or engaged in humbler trades. By the middle of the eighteenth century Huguenot mechanical ingenuity asserts itself. In 1742 M. Dubreuil, a Southern French planter, invents a cotton gin for separating the fibre from the seed. In 1770 M. Molineux is prominent in the establishment of spinning schools in New England. The hat industry in New England assumed such proportions as to arouse complaints of the company of hatters in London and to secure prohibitive legislation under George II. A list of the silver smiths and gold smiths of the last century would show many Huguenot names. Of these most interesting was Paul Revere, whose engraved silver plate, church bells and brass cannon were widely known and prized. His copper plate engravings were of political importance. American art history of the last century must also mention Abraham Delano, Jr., and Thomas Spence Duché, both portrait painters and pupils of Benjamin West; also Benjamin Henry Latrobe, architect of the much admired Bank of Pennsylvania at Philadelphia, the Roman Catholic Cathedral at Baltimore, and the south wing of the Capitol at Washington.

[Abstract of paper read before the New Jersey Historical Society, Jan. 22nd, 1889.]

EGYPT'S RELATIONS TO WESTERN ASIA.

By A. L. FROTHINGHAM, Jr.,

PROFESSOR OF ARCHÆOLOGY.

From the beginning of its history, Egypt maintained the closest relations with Western Asia, especially with Palestine and Phœnicia, through the Isthmus of Suez.

These relations were of three kinds: (a) aggressive on the part of Egypt; (b) aggressive on the part of Asiatics; (c) peaceful and normal. Chronologically they may be divided into six periods. I. Period of Ancient and Middle Empire: c. 4300 to 2500; moderately aggressive on the part of Egypt.—II. Period of Asiatic emigration and conquest: rule of the Hyksos for about 500 years, beginning in about 2250 B. C.—III. Period of Egypt's revenge on Asia; of the conquests under the XVIII and XIX dynasties, c. 1700 to 1300.—IV. Decay of Egypt. Loss of Asiatic dependencies. Internal troubles and foreign immigrations. Peaceful relations. 1300 to about 750.—V. Ineffectual attempts of Egypt to stem the tide of Assyrian conquest: from c. 725 to 671.—VI. Conquests of Egypt by the Assyrians, Babylonians, Persians and Macedonians. 671 to 330. The most important of these relations were political, but of considerable interest are the ethnographic, commercial, religious, artistic and other phases of this general subject. In all of these fields important advances in our knowledge have been made during the last few decades. But between 1885 and the present, certain important series of facts have been ascertained regarding the political relations of the two great continents, the full bearing of which on ancient Eastern history has not yet been fully ascertained. Two of these series are here taken up. I. The work of the Egypt Exploration Fund in and near the land of Goshen in the Delta, as connected with the Hyksos conquerors of Egypt, the mysterious Shepherds, and with the sojourn of the Israelites in Egypt and the route of the Exodus. II. The series of cuneiform tablets recently found at Tell-el-Amarna; which prove of the continuous sovereignty over the greater part of Western Asia of the Egyptian monarchs of the XVIII dynasty, and also show of that the cuneiform language and writing were not confined to

the valley of the Tigris and Euphrates but were in general use in Syria, Phoenicia and Palestine.

The suggestion of Lenormant-Babelon (*Hist. Anc. de l'Orient*) is adopted, according to which there is not only a chronological but an ethnographic and historic connection between the invasion and conquest of Southern Babylonia by the Elamites, the settling of Palestine by the Canaanites, and the invasion of Egypt by the Hyksos. In other words, that certain Hamitic tribes, fleeing from the Elamites, left Babylonia and spread over Palestine, Phoenicia and lower Syria, while part of them invaded Egypt. It is further thought probable that the Hyksos were partly Hittites. The latest discoveries have made it evident that the Hyksos had a monumental art totally different from the native Egyptian and this, combined with their foundation of a durable government, goes far to prove that they could not have been a mere agglomeration of nomadic tribes from the Syro-Arabian deserts.

It was known that from the time of Thothmes III (c. 1600) to the close of the XVIII dynasty—a period of nearly 150 years,—the greater part of Western Asia acknowledged the sway of Egypt. But until the discovery of the cuneiform tablets at Tell-el-Amarna, belonging to the Royal Archives, it was impossible to decide whether this suzerainty was permanent or whether after being imposed at the point of the sword by periodical expeditions it remained null and void in the interim. These tablets consist mainly of letters and reports addressed to Amenophis III and IV by the Kings and Governors of Palestine, Phoenicia, Syria, Mesopotamia and Babylonia, who were more or less subject, to or connected with Egypt at this time. These documents show the following conditions to have existed in time of peace. The cities of Palestine, Phoenicia and lower Syria were immediately dependent on

Egypt, which furnished to them governors and garrisons and from them received regular tribute. Further north and east we find five independent states of varying power, three friends and allies of Egypt—the Kings of Mitanni (or Naharina=Aram Naharaïm) in Upper Mesopotamia, of Babylonia and of Alashiya; while two were her enemies, the Kings of the Hittites and of the land of Shinar (Singara). The Hittites were then preparing for the leading role which they took soon after, when they had descended further southward at the close of this dynasty, and had to be met by the Egyptian monarchs of the xix dynasty.

In discussing the route of the Exodus (I Rameses, II Succoth, III Etham, IV Pi-hahiroth), Mr. Petrie in his volume on the recent discoveries of Pithom, explains Rameses as the land of Rameses, more or less synonymous with the land of Goshen, and Succoth as the name of the district and township of Pithom, while Etham he also considers to be not a place but a district and to be the desert of Atuma or Atimu of certain Egyptian documents. In this connection I wish to call attention to a peculiar parallelism in the two accounts of the route given in *Exodus* xv. 22, and in *Numbers* xxxiii. 8. In *Ex.* xiii. 20, they are said to encamp in Etham, in the edge of the wilderness [of Etham] and then in *Ex.* xv. 22 to go out, after crossing the Red Sea, three days into the wilderness of Shur, before coming to Marah. This is repeated in *Numbers* xxxiii. 6 and 8, except that they are said to go three days journey in the wilderness of Etham. Here we have Shur=Etham. Etham then is surely a district, as Petrie has asserted from other reasons, and it is probable that part of the great desert of Shur which is nearest to the borders of Egypt.

In 1887 M. Naville discovered, at a site in the land of Goshen called Tell-el-

Yahûdieh, "The mound of the Jew," a Jewish cemetery probably belonging to the followers of the high-priest Onias who erected here a temple in opposition to the one at Jerusalem.

[Abstract of a paper read at the University of Pennsylvania, Philadelphia, February 4, 1889.]

THE CLAIMS OF LITERARY STUDIES.

By T. W. HUNT,

PROFESSOR OF RHETORIC AND ENGLISH LANGUAGE.

After a brief notice of the accepted classification of studies and a reference to the pleasure attending the study of literature, special attention was laid upon the claims of such pursuits in the line of literary culture and specific mental training. The main object of the lecture was to correct the current error at this point and to present the department of literature on its disciplinary side. The present need of this higher view was pressed as also the need of assigning a larger province in our academic courses to such studies.

All possible emphasis was laid upon the need of a more pervasive English literary spirit in our American institutions.

[A lecture delivered at Columbia College, Jan. 26, 1889.]

THE HISTORICAL ANTECEDENTS OF THE ENGLISH DRAMA.

By T. W. HUNT,

PROFESSOR OF RHETORIC AND ENGLISH LANGUAGE.

The purpose of this lecture was to give an intelligent account of the connection of the oldest and crudest forms of the drama with the modern Shakspearian forms.

After calling attention to the attitude of the church, in the first centuries, to the stage and the actors, and to the later status of histrionic art in Continental Europe, special attention was given to scenic representation as it existed in Middle English days.

The theory that the Elizabethan drama is traceable only to the Italian of the Renaissance and has no dependence on earlier dramatic forms in England, was opposed; the relation of our vernacular drama to the classical was shown and the way thus opened for a full appreciation of the criticism of Symonds and Ward.

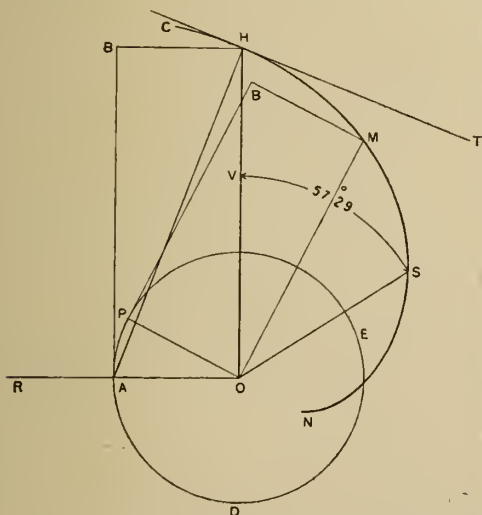
Emphasis was laid, in closing, upon the inherent ground of dramatic art; on the occasion of its unique method and, most especially, on the question — How to give the dramatic principle the best outward expression in deference to literary taste and ethical law.

[A lecture delivered at Columbia College, March 2, 1889.]

A NEW GRAPHICAL METHOD FOR DETERMINING A TANGENT TO THE SPIRAL OF ARCHIMEDES

By F. N. WILLSON,
PROFESSOR OF DESCRIPTIVE GEOMETRY, STEREOTOMY
AND TECHNICAL DRAWING.

Referring to the figure, let us have given the pole, O , and a portion of the spiral, $CHMN$.



Desiring a tangent at any point H draw the radius vector OH , an indefinite perpendicular to it, OR , and a radius vector OS at an angle of $57^{\circ}.29 +$ (the angle which

at the centre of a circle subtends an arc equal to the radius) with OH and on either side of it. A circle of radius $OA = VH$ (the difference between OS and OH) will cut OR in a point A which joined with H gives the normal AH . HT , drawn perpendicular to AH , is then the required tangent.

This construction depends upon the fact that the Archimedean spiral can be trochoidally generated and that if so considered in the case illustrated the point A is the instantaneous centre when the tracing point is at H . To obtain the given spiral as a trochoid take BH equal and parallel to AO and suppose it rigidly attached to a tangent line AB , while the latter rolls on the circle ADE . After rolling over any arc, as AP , PB will be the portion of the rolling line between its extremity and the point of tangency and BH will have reached BM . If the rolling be continued far enough H will evidently reach O . We see that $OH = AB$ and $OM = PB$. But the lengths AB and PR are proportional to the angular movement of the rolling line about O ; and as the Archimedean spiral may be defined as the curve the length of whose radius vector is directly proportional to the angle through which it has turned about the pole, it may evidently be generated by a point H attached as indicated to a rolling line AB .

The problem of drawing a tangent at any point of a given arc of the spiral therefore requires simply the determination of (a) the radius of the circle upon which such spiral could be trochoidally obtained, which — from the definition of the curve and the equality of the radius vector to the portion of the generator that has rolled upon the director — must equal the difference between any two radii vectores $57^{\circ}.29' +$ apart; and (b) of the point of contact of generator with director at the instant the tracing point is at the position where the tangent is desired.

For the fact that this spiral may be trochoidally traced I am indebted to Proctor's *Cycloids*. This application of properties consequent upon such generation, to the curve as ordinarily obtained, is believed to be new.

[Given before the Princeton Science Club, Dec. 13th, 1888.]

ELECTRICITY, LIGHT AND HEAT.

By C. F. BRACKETT,
PROFESSOR OF PHYSICS.

A knowledge of the conducting power of copper is of great importance to electricians. There is no sufficiently definite standard and frequently the manufacturers furnish wire that has 103 or 104 per cent. of conductivity. The difference cannot be the result of the impurity of the wire alone, as pronounced differences have been found in wires containing no arsenic or sulphur. The cause seems to be in the different molecular structures resulting from the processes of manufacture through which the wire has passed. In the process of drawing as well as in the annealing there are changes of density that affect the conductivity. The diameter, and therefore the cross section, of a wire is not uniform as it comes from the draw plate, being reduced in the middle, the size of the whole being at first reduced by the heating of the draw plate and then increased as the plate becomes worn. These variations, though slight in actual measurement, are sufficient to materially modify the conductivity as calculated from the cross section measured in any one place.

The recent researches of Hertz point out a possibility of producing an electric light without the present great waste of energy in the form of heat and of radiant energy that is not luminous. He has shown that in the case of an oscillatory discharge between conductors of the proper length there are waves of electrification

and that the nodes and ventral segments of these waves can be detected. Moreover, the magnetic influence at right angles to a conductor carrying an alternating current is in the form of waves similar to the waves of light but of much greater wave length. This wave length is dependent on the frequency of the alternations, the velocity being constant, and if it were possible to produce sufficiently rapid alternations of the current the conductor would be luminous, without an accompaniment of heat. At present we are not able to produce this rapid alternation of current, and must look for the solution of the problem in other directions. Possibly the study of the action of polarized light on selenium or some other conductor that is influenced by light may give some indications.

[An address before the New York Electric Club, December 20, 1888.]

SUMMARIES OF PAPERS PUBLISHED.

Early Bronzes discovered on Mt. Ida in Krete.

By A. L. FROTHINGHAM, Jr.,
PROFESSOR OF ARCHÆOLOGY.

Although on account of its central position, its traditions and its history we might have expected to find in the island of Krete, the birthplace of Greek art, the spot where the various influences converged which contributed to its formation, the confirmation of this assumption has not been brought by scientific excavation but in part by chance, through the unearthing by a wandering shepherd of some ancient fragments in a cave on Mt. Ida which proved to be the famous cave of Zeus, whose soil was filled with antiquities dating from all periods between the rudest

early works of the autochthonous Eteo-kretans and those of late Greek times. The series studied in this paper is that of some bronze votive shields and dishes (*φιάλαι*, paterae) hammered in relief with a decoration of figures and ornaments. The paterae are analogous to others found in Italy, Greece and Kypros and seem mostly of Phoenician workmanship, some in an Egyptian, others in a rude native style. The shields are unique and are of an earlier date than the paterae, which may be assigned to the VII or early VI century. Of these shields the earliest seems one on which is a scene that appears as if taken from some Assyrian bas-relief of the time of Assur-nazir-pal or Sargon, and which probably represents the god Assur adored by two attendant genii. Finest of all in workmanship and artistic interest is another almost as purely Egyptian in style as the preceding shield is Assyrian; on it is a large bird resting on a sphinx while on each side rises a large serpent under whose fangs stands a lion—perhaps an emblem of the contest between Egypt and Assyria, which we are beginning to find was a favorite theme with Phoenician artists. Several of the other shields are very rude and primitive and can hardly be attributed to the same class of artists: one of these, called the *Shield of the Warriors*, would lead us to attribute this class to early Greek bronze-workers, perhaps of the VII century, in imitation of Oriental work. These are, more or less, in the style so frequently used in early vase-painting, of concentric zones of animals, especially lions, bulls, and antelopes.

Rings and holes show that these shields, beaten out of such thin plates of bronze that they never could have been intended for use even on a leather back-ground, were hung up as offerings on wooden stands placed around the walls of the cave.

[*American Journal of Archaeology*, iv, 4.]

MISCELLANIES.

REPORT FROM THE E. M. MUSEUM OF GEOLOGY AND ARCHÆOLOGY.

WILLIAM LIBBEY, JR.,
DIRECTOR OF THE E. M. MUSEUM.

Some time ago the Museum was enriched by the addition of a handsome set of specimens, received in exchange for originals and casts sent to the Palæontological Museum at Munich. These numbered 279 specimens, representing 44 species, and were duly acknowledged in the last BULLETIN by Prof. Scott. Since that time a set of 64 specimens of 25 different species have been received from the British Museum (Geological Department), also in exchange for material sent out by our Museum last fall.

The species represented are as follows: *Thylacoles carnifex*, *Microchærus erinaceus*, *Ursus spelæus*, *Anoplotherium commune*, *Hyopotamus*, *Canotherium laticurvatum*, *Amphitragulus elegans*, *Palaotherium annectens*, *Palaotherium minus*, *Hipparion gracilis*, *Rhinoceros megarhinus*, *Rhinoceros antiquitatis*, *Rhinoceros perimensis*, *Platychærops Richardsons*, *Nesodon ovium*, *Mastodon arvernensis*, *Mastodon longirostris* and *Mastodon punjabiensis*.

These specimens and others which we hope to obtain during the course of the year will add materially to our interesting collection. Several of our students have also contributed specimens of value which they have come across in their summer vacation, and it is hoped that the Alumni will remember that we have such excellent facilities for displaying any gifts they may see fit to send us. Even duplicates will be of value for the purposes of exchange, particularly as we are now in communication with the principal museums and workers in Europe, where anything American is highly prized and sought after.

A number of casts of our more valuable and unique specimens have been made in the Museum, and these have been highly appreciated in Europe. This can be seen from the fact that they exchange for them originals and even especially prepared casts of specimens which we need.

The specimens obtained by our Western Expeditions have been very useful in this respect, the duplicates which we have sent away having brought us valuable specimens in return. This material is being most carefully worked out and studied and the specimens when finished make a very pleasing exhibit of our home activity.

There are some portions of our collection which need extension, for although we have a pretty complete representation of species in the general field of geological study, there are many typical specimens which would be very useful in our teaching collection. It is intended to keep these needs in view in the further development of the Museum.

EXAMINATION FOR THE DEGREE OF DOCTOR OF SCIENCE.

Mr. Henry Dallas Thompson, A. B., 1885 (Princeton) and A. M. 1888 (Princeton), was examined on February 9th, 1889, for the degree of Doctor of Science. The Committee of Examiners consisted of Professors Duffield, Brackett, Young, Fine and Magie. The President presided at the examination. The candidate submitted a thesis with the title "Geometrical Determination of the Coördination between the Hyper-elliptic Theta- and Sigma-Functions." The thesis was accepted by the Committee. The candidate was then examined by Professor Fine in Mathematics, by Professor Brackett in Experimental Physics and by Professor Magie in The Theory of Potential. Upon a report of the Committee, the Faculty recommended to the Board of Trustees that the degree of

Doctor of Science be conferred upon the candidate. The degree was accordingly conferred at the meeting of the Board on February 14th, 1889.

TWO NEW PRIZES.

Mr. Thomas B. Wanamaker, of the Class of 1883, has established a prize, by the gift of \$1000, to be known as "The Thomas B. Wanamaker English Language Prize." The terms and conditions are as follows:

"This prize, the yearly interest of one thousand dollars, is to be given to that member of the Junior Class who, at the close of the Junior year, shall pass the best examination in Early English and Shakespearian English, and offer the best thesis on some assigned topics in English Philology."

Mr. C. C. Cuyler, of the Class of 1879, has established a prize to be known as "The Theodore Cuyler Prize in Economics." It is founded by a gift of \$1000, and is to be given in the department of Political Economy.

AMERICAN SCHOOL AT ATHENS.

The Managing Committee of the American School of Classical Science at Athens assigned to Princeton the charge of the school for the coming year. Professor Orris has been appointed as director. He has been given leave of absence for a year by the Board of Trustees, and expects to sail for Athens before Commencement.

GEOLOGICAL EXPEDITION.

Preparations are making for a geological expedition to the West during the coming summer, for the purpose of adding to the museum collections. This will be Princeton's seventh expedition of the kind; the previous ones having been in the years 1877, '78, '82, '84, '85 and '86. A course of instruction in osteology and geology is held on Mondays at 5 P. M., open to candidates from the three upper classes.

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No. 3

PRINCETON COLLEGE

BULLETIN

JUNE 1889

EDITED BY THE
PRESIDENT AND MEMBERS OF THE FACULTY

PRINCETON PRESS

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PRINCETON COLLEGE BULLETIN.

EDITED BY THE PRESIDENT AND MEMBERS OF THE FACULTY.

VOL. I.

JUNE, 1889.

No. 3.

PROPOSED REVISION OF THE PLAN OF STUDY OF THE ACADEMIC DEPARTMENT OF PRINCETON COLLEGE.

The subjoined tables contain the proposed revision of the course of study in the Academic Department of Princeton College as passed by vote of the Faculty and as recommended by the Curriculum

Committee of the Board of Trustees. It now awaits the action of the Board of Trustees at their session this Commencement.

In the appended tables the Arabic numbers indicate the number of exercises a week in any subject. In this paper the first part gives in tabulated form the proposed curriculum and the second part the explanation of its leading provisions.

I. THE PROPOSED PLAN OF STUDY.

FRESHMAN YEAR.

ALL REQUIRED.

I TERM.		II TERM.	
Latin	4	Latin	4
Greek	5	Greek	4
Math.	4	Math.	4
English	2	Mod. Lang.	2
		Anatomy	1
<hr/>		<hr/>	
15 hours.		15 hours.	

SOPHOMORE YEAR.

REQUIRED.

Latin	2	Latin	2
Greek	2	Greek	2
Math.	2	Math.	2
Mod. Lang.	2	English	2
History	2	Logic	2
Chemistry	2	Zool. and Bot.	2
<hr/>		<hr/>	
12 hours.		12 hours.	

ELECTIVE.

(Student to take two Electives—4 hours.)

Latin	2	Latin	2
Greek	2	Greek	2
Math.	4*	Math.	4*
French	2	French	2
German	2	German	2
<hr/>		<hr/>	
16 hours.		16 hours.	

* Excuses from the 2 hours REQUIRED Mathematics.

JUNIOR YEAR.

REQUIRED.

I		II	
Physics	4	Physics	3
Psychology	2	Pol. Econ.	3
English	2	English	2
<hr/>		<hr/>	
8 hours.		8 hours.	
(Student to choose three Electives=		6 hours).	
14 hours.		14 hours.	

To enter for Junior Honors in any Department, student must take 4 hours Elective work in that Department.

ELECTIVE.

Electives in *Italies* open both to Juniors and Seniors;—(ordinarily) alternating subjects. A brace indicates alternating courses.

Electives in Roman open to Juniors only;—same subject each year.

	I. TERM.		II. TERM.	
I. MENTAL PHILOSOPHY.	[<i>History of Philosophy</i>	2]	[<i>History of Philosophy</i>	2]
	[<i>Advanced Logic</i>	2]	[<i>Plato. (Greek O.)</i>	2]
II. POL. SC. & HISTORY.	(<i>Ancient History</i>	2)	(<i>Med. and Mod. History</i>	2)
	(<i>Comp. Politics</i>	2)	(<i>Hist. Pol. Theories</i>	2)
	[<i>Am. Const. History</i>	2]	[<i>International Law</i>	2]
III. CLASSICS.	[<i>Latin (P.)</i>	2]	[<i>Latin (West)</i>	2]
	[<i>Greek (Winans)</i>	2]	[<i>Greek (O.)</i>	2]
IV. MOD. LANGUAGES.	[<i>French</i>	2]	[<i>French</i>	2]
	German	2	German	2
V. ENGLISH.*	<i>Anglo-Saxon</i>	2	<i>Early English</i>	2
VI. MATH. & MATH. SCIENCES.	Mathematics D.	2	Mathematics D.	2
	[<i>Mathematics Fine</i>	2]	[<i>Mathematics Fine</i>	2]
VII. NAT. SCIENCES.	General Biology	2	General Biology	2
	Chemistry	2	Histology	2
	<i>Hebrew</i>	2	<i>Hebrew</i>	2
	<i>Hist. Art</i>	2	<i>Archæology</i>	2
	<hr/>		<hr/>	
	15 Electives.		15 Electives.	

* To be eligible for Junior Honors in English the student must maintain First Group standing in the Junior Required English, and fill out his 4 hours Elective work in that Department by taking some Elective in Classics or Modern Languages.

SENIOR YEAR.

REQUIRED.

I.		II.	
Astronomy	3	Geology	3
Ethics	2	Ev. of Christianity	1
	<hr/> 5		<hr/> 4
(Student takes 10 hours Elective work.)			
<hr/> 15 hours		<hr/> 14 hours	

To enter for Senior Honors in any Department, student must take 6 hours Elective work in that Department, or, taking only 4 hours Elective work in that Department, must maintain First Group standing in the Required Study belonging to that Department.

No student will be eligible as a candidate for Special Honors in any Department in the Senior Year who has not passed an examination in the Honor courses of the preceding years in the Department in which he seeks Special Honors.

ELECTIVE.

In addition to those *common* to Junior and Senior years, there are the following Senior Electives :

I. TERM.		II. TERM.	
<i>Mental Philosophy :</i>			
Metaphysics	2	Contemporary Philosophy	2
Physiological Psych.	2	Science and Religion	2
Aristotle (O)	2	Pedagogics	2
<i>Political Science :</i>			
Science of Government	2	Municipal Law	2
Roman Law (Westcott)	2	Roman Law (Westcott)	2
<i>Archæology and Art :</i>			
History of Art	2	History of Art	2
Archæology	2	Archæology	2
<i>Ancient Languages :</i>			
Advanced Hebrew	2	Advanced Hebrew	2
Sanskrit	2	Sanskrit	2
Greek O. (Aristotle.)	2	Greek W.	2
Greek C.	2	Greek C.	2
Latin [West]	2	Latin (P.)	2
Roman Law (Westcott)	2	Roman Law (Westcott)	2
<i>English :</i>			
English	2	English	2
<i>Modern Languages :</i>			
German	2	German	2
[Italian	2]?	[Italian	2]?

Mathematics and Math. Sciences :

Mathematics	2	Mathematics	2
Pract. Astronomy	2	Pract. Astronomy	2
Theoretical Physics	2	Theoretical Physics	2
Practical Physics	2	Practical Physics	2
Laboratory Chemistry	2	Laboratory Chemistry	2

Natural Sciences :

Laboratory Chemistry	2	Lab. Chemistry	2
Adv. Biology	2	Adv. Biology	2
Palæontology	2	Palæontology	2
		Phys. Geography	2

PROPOSED SENIOR ELECTIVE EXCLUSIONS.

These are necessary on a liberal scale, if any schedule is to be made.
The principles to be followed in the exclusions are :

- (1) To leave open as far as possible electives of general character and those common to Juniors and Seniors.
- (2) To make mutually exclusive the more specialized electives and those clearly incongruous.

HONORS.

I. *General Honors*

To be granted for general excellence substantially as at present.

II. *Special Honors*

To be granted in leading general departments.

Special Honors in any Department shall be awarded only to students whose general average is above mediocrity. No student will be eligible as a candidate for Special Honors in any Department in the Senior year, who has not passed an examination in the Honor courses of the preceding years in the Department in which he seeks Special Honors.

- (1) *In Freshman Year*—(in 4 hour subjects)—in *Latin, Greek, Mathematics*.
(Cannot go into operation next year.)

- (2) *In Sophomore Year* (in 4 hour subjects.)

Latin,	4								
Greek,	4								
Math.,	4								
French,	4	(The Elective with Required M. L. and English).							
German,	4	"	"	"	"	"	"	"	"

(3) *In Junior Year*

In any Elective Department where 4 hours Elective work can be taken.

These are

- (a) Mental Philosophy.
- (b) Pol. Science and History.
- (c) Classics.
- (d) Modern Languages.
- (e) Mathematics.
- (f) Natural Sciences.

(4) *In Senior Year*

In any Elective department where 6 hours Elective work can be taken.

These are

- (a) Mental Science.
- (b) Pol. Science and History.
- (c) Archæology and Art.*
- (d) Ancient Languages.
- (e) Modern Languages.*
- (f) English.*
- (g) Math. and Math. Sciences.
- (h) Natural Sciences.†

*To make up the *six* hours Elective work in these departments, they must be combined with some cognate Electives; Archæology and Art with Latin, Greek, or History; Modern Languages with either English or Latin or Greek; English with Modern Languages or Latin or Greek.

†One of the courses taken must be Laboratory Chemistry.

THE RANKING SYSTEM.

To be modified so as to admit of estimating Special Honors.

The Ranking System to be continued as at present for Freshman and Sophomore years.

The number of Groups in Junior and Senior years to be four instead of six as at present.

II. EXPLANATION OF THE PROPOSED PLAN.

The principal ideas which underlie this revision of the curriculum are the preservation in the Required studies of the essentials of a liberal education and the furnishing of much more extended opportunities for special study along the line of the student's tastes and aptitudes by a decided increase in the Elective studies.

1. The REQUIRED STUDIES still include substantially the old standard American college studies regarded as requisite for the degree of Bachelor of Arts. The Freshman year consists solidly of required studies, and the Sophomore Year is practically the same, for although elective opportunities are offered in that year in Latin, Greek, Mathematics and Modern Languages, they do not crowd out these subjects as required studies, for all of them are required in Sophomore Year. What the Sophomore electives do is to give flexibility to the required course by allowing the student to throw his attention more decidedly in any two of the following directions: Latin, Greek, Mathematics, French, German, without dropping any of them as a required study. The Sophomore electives, in short, are nothing but extensions of subjects already taken, and not new subjects of study. Sophomore Year, accordingly, remains under the category of required studies, but differs from Freshman Year in its greater flexibility of arrangement.

It should be added, also, that two new studies appear in this year: the elements of Chemistry and Logic.

These two lower years are now so adjusted, that with some arrangement for maximum entrance requirements, entering Freshmen, who are prepared on advance work in either Latin, or Greek, or Mathematics, and perhaps English and Modern Languages as well, may

be admitted to advanced divisions from the very start in Freshman Year. This will enable a student, who is of advanced ability in Greek, for example, to go ahead in his Greek, without being forced down to some lower division in Greek because his preparation or abilities are below par, say in Mathematics. The arrangement of divisions in the weekly schedules under the new plan will permit a student to go ahead in any department where he is fit to go ahead, and will keep him in a lower division only when he needs to be kept there. It is hoped that this will do much to take away the discouragement often felt by a bright student in classics whose general average is brought down by his mathematics, and consequently his work falls just where it ought not to at present. He is too low for his classics and too high for his mathematics. A man at the top in classics and at the bottom in mathematics certainly does not belong in the middle of the class in either.

The required studies of Junior and Senior Year constitute a substantial part of the course. Over half the work in Junior Year and nearly one-third of the Senior Year consists of required studies. This is a diminution of the number of required studies at present given to the Seniors; but no subject of required study has been made elective. The change is effected by a reduction of the time assigned in certain instances and by the transfer of Chemistry and Logic to the Sophomore Year.

Taking all the required studies of the course into one general view, it will be noticed that they may be arranged by general departments as follows:

1. In *Mental Philosophy*.

Logic.

Psychology.

Ethics.

Evidences of Christianity.

- II. In *Political Science* and *History*.
General History.
Political Economy.
- III. In *Classics*.
Latin.
Greek.
- IV. In *Modern Languages*.
French (or German?)
English.
- V. In *Mathematics* and *Math. Science*.
Algebra.
Plane and Solid Geometry.
Trigonometry.
Elements of Calculus.
Physics (including Mechanics).
Astronomy.
- VI. In *Natural Sciences*.
Chemistry.
Geology.
Anatomy.
Zoology.
Botany.

Each general department of study accordingly has in the required work courses which are fundamental and complete the circle of the studies needed for an all-round liberal education. The Bachelor of Arts degree of twenty or thirty years ago scarcely embraced as much as this,—certainly not more. It is evident therefore that Princeton proposes in its core of required work to preserve the good features of the old American college course.

But this general representation of various departments in the required work has another very great advantage in connection with the formulation of a scheme of elective studies, for it enables a student to pass into any general elective department with some intelligence, because he has had the elements of some fundamental study in his required work. Thus the earlier required work in Mathematics and Classics leads naturally to the higher elective courses in the same subjects. General History in Sophomore Year

prepares for intelligent choice in the cognate electives which follow in Junior and Senior Years. So Logic and Psychology precede what they should precede in elective work. The general course in required Physics opens the way to their succeeding elective courses in Theoretical and Practical Physics.

The same is also true of the co-ordination of the required studies among themselves. The earlier required Classics, Mathematics and Modern Languages disappear when the properly later studies, such as the sciences and philosophy, come into the course. So also inside each department of required work taken separately. Chemistry, Physics, Astronomy is the order in these sciences. So in philosophy we have Logic, Psychology and Ethics in due order.

2. The ELECTIVE STUDIES are practically confined to Junior and Senior years and to graduate courses, for the elective extension into Sophomore year, as has been noticed above, is only enlargement of opportunity in old subjects. The most difficult part of any curriculum is the elective question. What shall be the range and the co-ordination of elective studies, and how shall they be adjusted to the required work? Without discussing the various solutions of this question, either the one extreme of constituting rigid groups of electives, in which a student must take every study in a fixed group and no other, or the other extreme of promiscuous unassorted Electives into which the student may dip at will, with no restrictions save those of the necessary limitation found in constructing the time table of college exercises, we may say in brief that the proposed curriculum avoids both these solutions. Nor is the proposed arrangement a compromise lying midway between them, but is based on a clear principle. That principle is that as stud-

ies of a most central and general character are to be selected for the required studies, which are to furnish the discipline and the all-round open view necessary in a liberally educated man, the elective studies should be introduced gradually with the most general and central courses, be developed organically according to the nature of the several studies, leading away more and more from the earlier general courses to the later specialized work, and the number of these courses should be increased steadily as the more sub-divided specialties are approached,—and in this way the whole circle of college and university study be developed and opened to the student harmoniously from its fixed center in the required work out to its circumference of specialized studies extending and unfolding in all directions. To accomplish this end electives of general character and introductory in their nature form the staple of the proposed Junior electives,—arranged under the same general departments as the required work of the whole course. The Senior electives are more numerous and as a rule more specialized in character, and the most specialized work is left for graduate courses.

The effect of this on the elective choices of students will, it is believed, be marked and wholesome. Apart from the educational loss involved in a change of intended life-work on the part of the student,—a contingency, by the way, which can never be coped with completely by any elective arrangement, the principal trouble encountered by real students in their elective choices is ignorance of the precise character of the courses offered. This will be obviated in great measure by the preparatory required studies leading in various elective directions and by the reservation of highly specialized electives until the more general electives have been taken. So that even if the student chooses what he

does not afterwards wish to continue, his loss is less by taking an elective of general character and hence ordinarily of greater educational value than if he had plunged ignorantly into specialties, whose almost exclusive use is for the special profession or science to which they lead.

3. Another help towards intelligence and coherence of elective choice on the part of students is the proposed arrangements of HONORS. These are to be of two kinds :

(a) *General Honors*,—to be granted for general excellence substantially as at present.

(b) *Special Honors*,—for excellence in separate leading departments.

The preservation of General Honors is intended to keep the pressure for Special Honors from interfering with any students who prefer to continue general studies with a view to fine general culture and without regard to specialties of any sort. It is not desired that this type of scholarship shall ever disappear from Princeton.

The Special Honors, however, are intended to meet the aptitudes and tastes of students for some one line of study, and to train scholars by continuous and elaborate work in the line of their choice. The awarding of Special Honors is accordingly based on proficiency both in quantity and quality of work in the separate leading departments of cognate studies. Thus there are Special Honors obtainable in Classics, Mathematics, Modern Languages, English, Mental Philosophy, Political Science and History, Mathematics and the Mathematical Sciences, the Natural Sciences, and others.

The pressure of Special Honors is expected to operate on some students in the direction of concentrating their elective choices on cognate studies, as the pressure of General Honors will operate on others in favor of the choice of studies of general cultural character.

This explanation is of course confined to the leading features of the new plan. Other matters of great interest connect with it, but lack of space prevents their present exposition. The central idea of the whole revision is to put students where they belong for their work in required studies and so co-ordinate this with the electives, that the choices of elective studies shall be intelligent on the part of students and valuable to the cause of our civilization in the production of enlightened citizens and also to the cause of learning by the training of thorough scholars.

EXTENSION OF THE LOCAL ENTRANCE EXAMINATIONS.

The number of places at which Local Entrance Examinations will be held this year is unusually large. For the June examinations on Thursday the 20th and Friday the 21st, nearly forty places have already been appointed on application from alumni or schools. The arrangement of the examinations is twofold:

(1) For preliminaries and entrance to three lower classes:

New York—At the Y. M. C. A. building,
23d Street and 4th Ave.

Philadelphia—Lafayette Hotel.

These two examinations will be in charge of professors from the College.

(2) For preliminaries and Freshman entrance:

In New England—

Phillips Andover Academy, Mass.

Phillips Exeter Academy, N. H.

Mt. Hermon Academy, Mass.

In New York—

Albany—At Albany Academy, Prof. Warren.

Syracuse—In care of Rev. A. H. Fahnestock.

Ogdensburg—At Ogdensburg Academy, Prof. J. E. Cheetham.

Buffalo—At Buffalo High School, Prof. Fosdick.

In Pennsylvania—

Harrisburgh—In care Rev. George B. Stewart.

Wilkesbarre—In care Rev. Dr. Frank Hodge.

Chambersburg—In care Rev. J. G. Hibben.

Bellefonte—In care Rev. J. P. Hughes.

Pittsburgh—At Equitable Building, 516 Market Street, in charge of Dr. George Woods.

Shady Side Academy, near Pittsburgh—In charge of Prof. Crabbe.

Eric—In charge of Mr. Wm. Spencer.

In the South—

Baltimore—At Faith Church, in charge of Rev. J. P. Campbell.

Washington—In care of Mr. H. E. Davis, 468 Louisiana Avenue.

Louisville—In care of Mr. John W. Barr, 436 West Jefferson St.

Atlanta—In care of Prof. T. Æ. Means.

Bellbuckle, Tenn.,—At the Webb School.

San Antonio, Texas,—In care of Prof. W. B. Seeley.

In the West.

Cincinnati—Law School Rooms, in care of Mr. P. A. Reece.

Dayton, O.,—In care Prof. Deaver.

Chicago—In care Mr. W. B. McIlvaine, Borden Block.

Peoria, Ill.,—In care Mr. W. S. Horton.

St. Louis—In care Hon. S. M. Breckinridge, 304 N. 8th Street.

Omaha—In care Rev. Mr. Henderson.

Minneapolis—In care Mr. Thos. Peebles.

Denver—In care Mr. F. Spalding.

San Francisco—In care Rev. Dr. Shearer, 757 Market Street.

Besides the points enumerated above several other examination places have been appointed.

THE NEW DEPARTMENT OF ELECTRICAL ENGINEERING.

At the beginning of the next college year the new department of Electrical Engineering will open its courses to students. The course of study is intended to be such as will prepare those who pursue it to engage in any branch of engineering or technical work which demands a scientific knowledge of electricity. The course, or, more properly, that part of the course which is under the immediate control of the department, will occupy two years. This amount of time is so scanty when the wide extent of the field of study and the amount of practical work involved are taken into consideration, that a thorough knowledge is to be required of every applicant for admission of those subjects which are essential to the successful prosecution of his work. The subjects required for admission are mathematics, including trigonometry, analytical geometry and the calculus; physics; and the elements of chemistry. Mathematics will be treated as a working instrument, of which the student has already acquired control, and no time during the course will be devoted to it. The same may be said of the French and German languages. The applicant will not be examined on his knowledge of them, but constant reference will be made to French and German books and current electrical literature, and the ability to read those languages will be of great service to the student. Regular students of the School of Science who wish to enter this course may be admitted to it without examination at the beginning of their Senior year and Academic students may enter at the same period if they have pursued the Junior Elective course in Mathematics.

The course will open, on the theoretical side, with the study of the theory of electricity, with Mascart and Joubert's treatise as the basis of the course. Then will fol-

low the theory of electrical measurements, and the various technical courses. These will cover all the important applications of electricity in the arts; the theory and construction of dynamo machines; systems of electric lighting; electric transmission of power; electro-chemistry and electro-metallurgy; telegraphy and telephone systems. The practical part of the course will include first a laboratory course in general physics, with special reference to the determination of force and energy relations; then will follow an extended course in electrical measurements and in electrical testing. Each of the technical courses will involve practical work, which will, so far as possible, be laid out on a scale similar to that which is met with in actual practice.

To meet the needs of this course a large number of galvanometers, sets of resistances and other pieces of apparatus have been ordered, and the outfit of the laboratory in all the instruments used in electrical investigations will be very complete. The outfit of dynamo-machines, systems of electric lights, and other appliances used in the technical application of electricity, will be such as to furnish a model of actual practice and to meet all the requirements of the technical courses.

A building will be put up for the use of the department, to serve as a place in which standard instruments may be kept and work requiring special accuracy may be done. It will be built of brick, and no iron will be used in its construction. It will contain a large standard tangent galvanometer, and high resistance galvanometers, an absolute and quadrant electrometer, sets of standard resistances, etc., and will be connected with the School of Science by heavy conducting wires, so that instruments used in the laboratory may be readily compared with the standards.

ORIGINAL CONTRIBUTIONS.

THE OREODONTIDÆ.

By W. B. SCOTT,
PROFESSOR OF GEOLOGY.

This curious family of Artiodactyla has been known for more than forty years, but even yet the structure of the various genera which compose it, and their relationships to each other, as well as the connection of the family as a whole with other groups of the Artiodactyla, are very imperfectly comprehended. The family is, so far as is yet known, entirely confined to North America; the specimens who have been referred to it from India by Lydekker, and from the phosphorites of Quercy by Schlosser, are altogether too problematical to constitute any exception to this statement. As regards their distribution in time, the Oreodonts range from the top of the eocene to the close of the miocene, when they disappear, leaving no representatives behind them. In the Uinta formation the family is represented by *Protoreodon*, in the White River by *Oreodon* and *Agriochærus*, in the John Day by *Eporceodon*, *Colorceodon*, *Agriochærus* and *Merycochærus*, in the Deep River by *Merycochærus*, *Merychys*, *Leptauchenia*, *Cyclopidius* and *Pithecestes*, and in the Loup Fork by *Merychys* and *Merycochærus*.

The family separates itself naturally into two subdivisions; the *Agriochærinæ* comprising *Agriochærus* and *Colorceodon*, and the *Oreodontinæ* which contains the remaining genera. The oldest known genus of the family is *Protoreodon* from the Uinta eocene which was discovered by the Princeton expedition of 1886 in Northern Utah. This genus had five digits in the manus, an elongated and narrow cranium, and an open orbit. The upper molars are extraordinarily interesting in that they are composed of five tubercles, instead of four as in all the other genera, thus connecting the oreodonts with the usual type of dentition of the European and American eocene

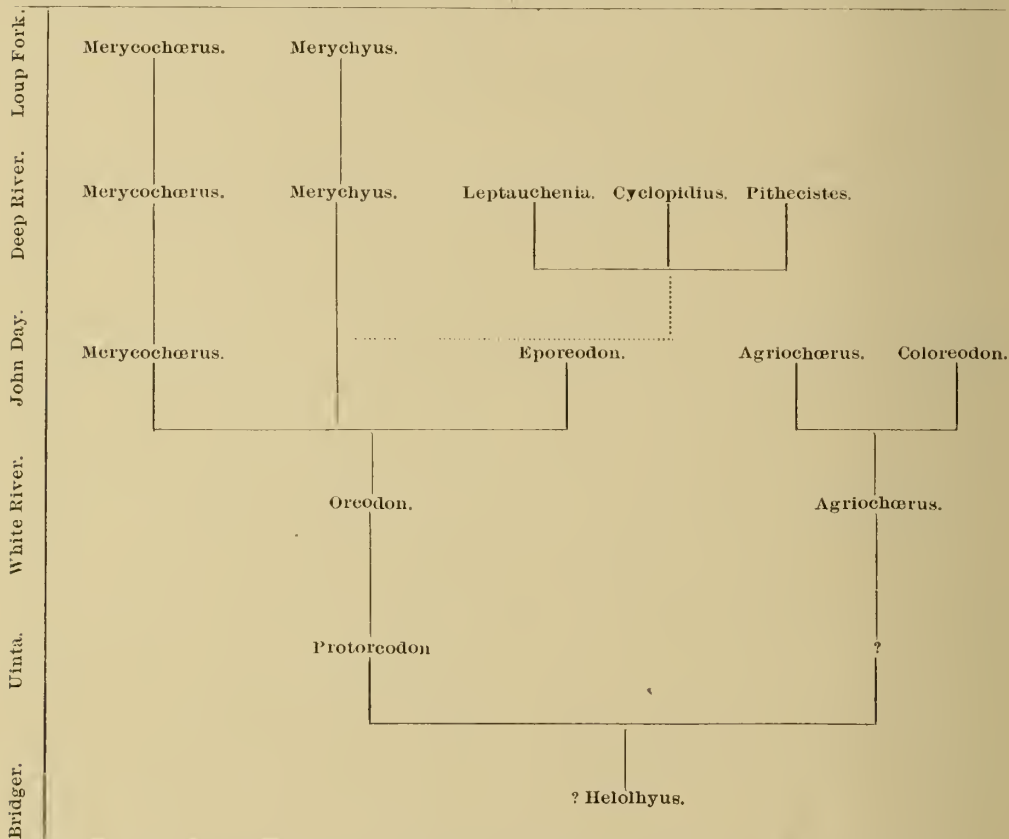
artiodactyles. In the lower Miocene the genus *Oreodon* is enormously abundant and is represented by many species; this genus is manifestly descended from *Protoreodon* and still retains the first digit in the manus, as I announced in 1884, a fact which is of the utmost importance for the phylogeny of the ungulates. A series of slight modifications leads from *Oreodon* to *Merychys* and *Merycochærus*, the latter of which is the largest genus of the family and very abundant in the John Day Miocene. These genera differ from the other members of the family in having the manus adaptively reduced, and in the extraordinary displacement of the magnum towards the radial side. In *Merycochærus* the face is much elongated, and the cranio-facial axis is no longer straight but bent upon itself; in *Merychys* the face is shortened, the molar teeth tend to become prismatic as in the true ruminants, and small facial vacuities make their appearance. Another distinct line of the family is represented by the three anomalous and bizarre genera, *Leptauchenia*, *Cyclopidius* and *Pithecestes*, in which the auditory bulke are enormously inflated, the face is almost entirely occupied by vacuities, reducing the nasal bones to mere splints, and the incisors and premolars are much reduced, in some of the genera the incisors disappear. These extraordinary animals were probably aquatic in habit.

The *Agriochærinæ* are already separated from the other sub-family in the Uinta, since the dentition of *Protoreodon*, primitive as it is, plainly inclines towards the *Oreodontinæ*; nevertheless *Protoreodon* presents many features of resemblance to *Agriochærus* and clearly is but slightly removed from the dividing point of the two sub-families. Indeed, were it not for the closed dental series and the flattened external cusps of the upper molars, this genus would itself be exactly the sought for common ancestor of the two sections.

This common ancestor very probably is the *Helohyus* of the underlying Bridger eocene, but as only the superior molars of this form are known, this statement is still open to question. The upper molars of *Helohyus* are rather bunodont than selenodont, but the beginnings of the crescentoid pattern are distinctly marked, and the crown is composed of five tubercles. These teeth closely resemble those of some of

the European cocene artiodactyles, as for example *Rhagatherium*.

The relationship of the oreodonts to other artiodactyle families have been very variously regarded. Leidy has stated that the family combined features of the deer, camel and hog, and that their affinities could best be made clear by calling them "ruminating hogs." Rüttimeyer and Schlosser have insisted upon their con-



nection with the camels, and the latter has gone so far as to place *Leptauchenia* in the phylogenetic line of the llamas. The abundant materials now at command show these statements to be erroneous, certain resemblances to the pigs on the one hand and the camels on the other are undoubtedly present, but these are merely primitive features common to nearly all

the early families of artiodactyles, some of which have been preserved till recent times by the pigs and others by the camels, and are therefore of small value in determining nearer affinities. The same statement applies to Cope's view as to the connection between this family and the tragulines. The truth would appear to be that the *Oreodontidæ* took their origin in the great

group of the buno-sclenodonts so abundant in the eocene formation, from forms closely allied to if not identical with the so-called eocene hyopotamids. From this point the family took its own course of peculiar development, branching out into a considerable variety of genera, but always remaining on a comparatively low plane, and died out without leaving any successors, thus forming an isolated series, comparable to the Anoplotherioids and Xiphodonts of Europe.

The mutual relations of the oreodont genera may be expressed graphically as in the table on page 76.

*PREPARATORY TRAINING FOR COLLEGE.**

The members of the Schoolmasters Association of New York avail themselves with great pleasure of your courteous invitation, and hope to interest you in the aims that led to their organization. They are confident that various benefits will accrue to the cause of secondary education in this vicinity from the interchange of opinions which will develop from their meetings, benefits that will acquire greater significance, when they are able to subject them to the judgment, criticism and possibly approbation of those who control the higher collegiate education of youth. Until within the last two years the preparatory schools of New York and vicinity presented the singular spectacle of a large number of workers in a common field, actuated by common interests, yet utterly unacquainted with each other, and completely unfamiliar with each other's methods. I think it was to some extent the conviction of how great a waste of mental effort was involved, where dozens of men were pioneering their way in the same

direction without assistance from each other's experiences that led to our organization. The fertility of devices, applied by various of our members to the treatment of educational problems, and incidentally disclosed in our meetings, has justified the value of our association. It is an inevitable and a welcome outgrowth of such union that personal and subordinate considerations dwindle away before the questions of vital concern. It has become clear that there are essentially but two great questions which we must meet; how can we best fit our pupils to meet the requirements of the college, and what is the standard which aside from these requirements we propose to establish for our work. Both questions intimately concern the relations of our young protégés to their later college work, and hence it may not seem inappropriate to you, if both questions are drawn into the discussion. The hardships and incongruities, resulting from the diversity of demands, made by the various colleges in our Eastern and Middle States, are felt most vividly by *our* preparatory schools. The cosmopolitan character of New York manifests itself as in every other sphere of life, so too in this unfortunate particular that in the choice of a college every shade of opinion, all possible predilections assert themselves in parents and pupils. Family ties, native bias, the statements of the public press, and what not, will cause a dozen pupils to strive for entrance into just as many different colleges. The individual school cannot throw its entire weight in favor of one or two institutions, but must, if it would retain its prestige, be ready to prepare for any college—with what result? It is impossible at the present day to maintain in the highest classes the idea of a class-unit. Let me explain why. The pupil whose mathematical regimen has been the Wentworth series of text-books, grows restive, if the

[*Paper read at Princeton, June 1st, 1889, by Dr. Julius Sachs, President of the New York Schoolmasters Association.]

particular college for which he is preparing, has officially expressed a preference for Loomis or Legendre, and however his teacher may try to impress upon him the fact that knowledge is knowledge, in whatever form it be cast, he is under the ban of the tradition that said college prefers that particular mould and not any other. College instructors are apt to make light of these discrepancies, but a week's experience in the preparatory school would unfold a picture of disquietude, caused by these differences, that they as broad educators would soon endeavor to end. Again in Latin what is it the colleges demand? Comprehensively speaking, such a knowledge of the elements of the language that the entering pupil can appreciate the language of a lucid historical writer, of a more ornate rhetorician, whose writings are tinged with a little popular philosophy, and of an epic poet in whose work the art of poetical composition disappears from the mind of the pupil, as the web of historical and mythological incident carries him along in its enchanting train. Why then, if this is the average proficiency desirable, should we depart from the line of what generations of scholars have accepted as the best, to substitute for the vigorous and manly Caesar the rather turgid Sallust whose pragmatic and psychological value is utterly beyond the reach of a boy; why should we divert the young minds from the Epic flow of the *Æneid* to the artificial copy of a highly artificial Greek original in the *Eclogues*? Honestly speaking, I have still to meet that pupil who could derive the slightest intellectual enjoyment from the *Eclogues* at the stage when he is usually obliged to read them. It seems as undesirable to propose these works as to substitute for Milton's *Paradise Lost* his *Samson Agonistes* or *Comus* or for Shakespeare's *Macbeth* his *Troilus* and

Cressida, admirable works in their way, but not the standards by which we can hope to give the youthful mind the best measure of the respective talents of those authors. Exactly the same condition of things holds for other branches, and the outcome is disorganization. Our Senior classes no longer exist as units; they are subdivided into sections, the one practicing sight-reading for Harvard, the other rapidly coursing through Ovid, a third acquiring with many groans the unsympathetical botanical vocabulary of the *Eclogues*. And this subdivision does *not* correspond to the variety of courses that an endowed college can offer for election to its students; the disparity in the work is thrust upon the school, and is not offset by any intellectual gain. On the other hand, if a normal course in Latin and Greek were everywhere acceptable, the old *esprit du corps* of the preparatory school could be restored with much of the enthusiasm that improved methods of instruction could infuse; the teacher could afford to wander occasionally with his pupils from the precise duties of translation and grammatical drill into the attractive byways of literary comparison, and make them realize the influence that emanates from their authors through all art and literature, and the pupil would awaken to the fact that pedantic accuracy is not a goal *per se*, but is the road along which, before his time, generous souls have travelled in their search for truth. The fewest of the present generation of teachers could, I believe, compute how great an economy of effort would result from unification in the demands on the preparatory schools, but all will admit that if such unification were now brought about, after we have endeavored to adapt our schools to variety, a degree of excellence would be attained, equal to the highest standard that is at present set by any one college. College

officers will, I think, bear us out in the statement that no increase in the admission demands ever failed to find a response on the part of the schools that were the special feeders of that college; the preparatory school at once shapes its curriculum to meet the new demand. But how are we, upon whose schools the demands of a dozen different colleges focus, to meet these? It has happened not infrequently that an annual Catalogue, published late in Autumn, after annual schedule has been arranged, springs upon us at short notice a new requirement, to be met by our pupils at the very next summer-examination.

The remedy for this distressing state of affairs *can* be found in the concerted action of a number of our leading colleges. As far as we are concerned, no demand would be considered too searching, if it represented the required standard of all important colleges. Nor would such uniformity have the effect of paralyzing the individuality in the requirements of the respective colleges; it would still be recognized by the preparatory school that the one college insisted above all on elegance of translation, another on grammatical accuracy, another on the historical and mythological background, still another on the analysis of versification, and the special aims of all could be fulfilled in one general systematic course. There would be as little difficulty in cultivating in Geometry extreme accuracy, brevity of expression, or the capacity to grapple with original problems as there would be in combining in the study of English, accuracy with latitude of reading. Economy in method is the solution of the difficulty, and though this has hitherto been the special cry of those engaged in the education of the masses, it seems quite as urgent in our work. The positive gain that would accrue to the colleges from this reform would be manifold, but I shall res-

trict myself to one branch in which the advantage would be most apparent. The study of history, it is generally admitted, is carried on in most of our schools and colleges in a very perfunctory way. In the preparatory school it has always given way to the overmastering demands of the classical and mathematical curriculum, and has been crowded into the odd hours that can be eked out by the master. Even the pupils realize that it is not history they are learning, but that it is an *examination* in history for which they are preparing; and the short cuts, the aids prepared by the teacher, prove to them that he too has been obliged to calculate what questions can possibly or probably be presented to them. The result was recently summarized for me by a leading specialist; his studies abroad in Mediæval History had secured him a position at a prominent college where he teaches Juniors and Seniors. I asked him, "How many men do you find in your own college that possess an *elementary* acquaintance with a number of the cardinal facts in Mediæval History?" "None, absolutely none, and my work is in consequence reduced to a painfully elementary character." And is it not the fact that because of this deficiency it is almost impossible to enlist the interest of students in the deeper problems that underlie the historical record? It was a matter of common notoriety that when some years ago the Oriental question agitated the civilized world, the editorials and correspondences of our leading periodicals betrayed the most lamentable ignorance, and the only valuable utterances on the subject were to be found in the columns of a single New York weekly, and were the work of a highly accomplished foreigner who was not a historian by profession. Now to a people strongly impregnated with a political instinct, as our community undoubtedly is, the study of institutions and their

growth ought to prove of absorbing interest, and would too, if the foundation work could be laid at a sufficiently early date in the plan of education. And it is here that I can touch upon the point where the college authorities can give the greatest moral support to the preparatory schools. If there were a consensus in the utterances of our college presidents and professors, it would suffice to convince the public at large that the present mode of crowding the preparation of a boy for college into four years is radically wrong. The average boy who has naught but a grammar-school education, cannot and should not be fitted in four years for college. If there be an educational value in Latin and Greek, and on this point we surely agree, it is attainable only when the knowledge of them is gradually built up; it is not to be gained by the forcing process. It does not follow that the student ought to enter college at a more mature age than he now does; the remedy is to be applied at the other extremity; the preparation should cover six years, the first two of which could easily be engrafted upon the final years of a grammar-school course without unduly increasing the burden on a child's mind. On the contrary, no more wholesome stimulus could be furnished the mind of a youth of *ten* than 1. a gradual introduction into the Latin language, and 2. the advance from the history of his own country to the consideration of the leading facts in modern European history. The growth of his own country would appear to him linked by the palpable relations of cause and effect to the great movements abroad, and he would become eager to group around the first frame work of facts the more detailed record of foreign history. The torpor which it is so often alleged is evident in the upper grammar school classes would disappear before the generous glow that the study of history can infuse. And let it not be assumed

that there is a dearth of time to meet these new topics; a bold excision of the time allotted to arithmetic to just one half of what it now claims, and the results would not be a whit poorer than they now are; there would probably be a little more thoughtfulness and less of so called figuring employed in the teaching of the subject.

What the study of Science would gain by absolute uniformity in the requirements, I leave to those to discuss who are more especially qualified; the reign of the text-book would at all events promptly give way to the only scientific method,—that at the laboratory-table. I hope that in thus stating the issue, as it appears to a teacher of the secondary school, I do not appear to you presumptuous; my aim is to elicit an expression of opinion on matters to which we cannot close our eyes. We have not the inestimable privilege of the college professor, who, limiting himself to his chosen field, finds in it ample opportunity for the development of individuality and originality; our work requires us to traverse various tracts, but let not all opportunity for concentration be sacrificed to the needlessly diffuse requirements, as they now face us.

An agreement, entered into by the presidents of ten of our leading colleges, to adopt identical requirements, to banish all mention of preferred text-books or editions would force all the smaller colleges into line, and would in five years, appreciably raise the quality of preparation in every branch of instruction. What an inestimable advantage to thoroughness is it that in Germany the same course of study is pursued at every Gymnasium, and that a successful final examination at any one of the Gymnasias entitles a young man to enter any University, his choice being determined by the advantages for study he there expects to find.

SUMMARIES OF PAPERS READ BEFORE
SCIENTIFIC SOCIETIES.

THE MOSAIC ORIGIN OF THE PENTATEUCH.*

By DR. W. HENRY GREEN,
PROFESSOR AT THE SEMINARY.

The relation in which the contents of the Pentateuch stand to the problems of physical and ethnological science, to history and archaeology and religious faith, makes it a question of great consequence from various points of view, whether the Pentateuch is a veritable, trustworthy record, or is a heterogeneous mass of legend and fable, from which only a modicum of truth can be doubtfully and with difficulty elicited. In the settlement of this question, the consideration of its authorship enters as an important factor: for, while its credibility is not absolutely dependent upon its Mosaic authorship, and it might be all true, though it were written by another than Moses and after his time, yet, if it really was the production of Moses, there would be in this fact the highest possible guarantee of the accuracy and truthfulness of the whole.

That the Pentateuch was the work of Moses was argued: (1.) From the traditional belief of the Jews, confirmed by the infallible testimony of our Lord, and of the inspired writers of the New Testament.

(2.) From the allusions to the Pentateuch or its contents as the book of Moses, the law of Moses or the commandments of Moses, which are to be found in every period of the Old Testament from *Malachi* to *Joshua*.

(3.) From the direct testimony of the Pentateuch itself. Of the three principal bodies of law contained in the Pentateuch, the book of the Covenant, *Ex.* 20-23, is expressly declared to have been written by Moses, *Ex.* 24: 4. So also the law of Deuteronomy, *Deut.* 31: 24. The so-called

Priest-Code or ritual law, contained in *Ex.* 25-31, 35-40, *Leviticus* and the legal portion of *Numbers*, is said in all its parts to have been communicated by the Lord to Moses. Two passages in the history are in so many terms attributed to the pen of Moses, *Ex.* 17: 14, *Num.* 33: 2. It is further obvious, from the whole plan and constitution of the Pentateuch, that its history and legislation are alike integral parts of one complete work. *Genesis* and the opening chapters of *Exodus* are plainly preliminary to the legislation that follows. The historical chapters of *Numbers* constitute the framework in which the laws are set, binding them all together and exhibiting the occasion of each separate enactment. If the legislation is, as it claims to be, Mosaic, then beyond all controversy the preparatory and connecting history must be Mosaic likewise.

(4.) The terms, in which the laws are drawn up, point unmistakably to the sojourn in the wilderness prior to the occupation of Canaan as the time and the situation, in which they were produced.

(5.) The contents of the Pentateuch are either directly alluded to or the facts of its history and the existence of its institutions implied in numerous passages in the subsequent books of the Bible.

(6.) The Pentateuch was known and its authority recognized even in the apostate kingdom of the ten tribes. Although no valid argument is yielded upon this point, as was at one time supposed, by the Samaritan Pentateuch, the fact is sufficiently attested by the narrative of the schism in *I Kings*, 12, as well as by the prophets *Hosea* and *Amos*, whose ministry was exercised in the Northern kingdom.

Objections drawn from three different quarters were then rebutted, viz., from

1. The literary character of the Pentateuch, which is said to indicate its derivation from pre-existing written sources, themselves posterior to the time of Moses.

[* Summary of an address delivered by invitation at Wellesley College, on Friday, May 17, 1889.]

2. The diversities and alleged inconsistencies of the different codes, which it is said, show that these codes belong to distinct periods and represent successive stages in the growth of the national institutions.

3. The disregard of the laws of the Pentateuch to an extent and under circumstances affirmed to be incompatible with their existence for ages after the death of Moses.

The incongruities and gratuitous assumptions involved in the denial of the Mosaic origin of the Pentateuchal institutions were pointed out. Even though one or more paragraphs could be proved to be post-Mosaic, this would merely demonstrate that such paragraph or paragraphs could not have belonged to the Pentateuch, as it came from the pen of Moses, not that the work as a whole did not proceed from him. It is far easier to assume that some slight additions may here and there have been made to the text, than to set aside the multiplied proofs that the Pentateuch was the production of the great legislator.

THE HISTORY OF PHILOSOPHY.

By ALEXANDER T. ORMOND,
PROFESSOR OF MENTAL SCIENCE AND LOGIC.

It is only in the present century and since Hegel that the history of philosophy has been treated in a competent manner and with true historic insight. The most important of its questions arise in connection with its scope, method and relations to other philosophic disciplines.

Philosophy arose historically as an effort of the human reason to explain the world, including man, in its ultimate principles and as a totality. This attempt according as the dominant idea was that of unity, causality or substance, has resulted in the conception of philosophy as *Scientia Scientiarum*, Rational Theology or Metaphy-

sical Ontology. Most philosophical systems may be classed under these three rubrics.

The method of the history of philosophy is founded on the conception of its phenomena as constituting a developing series. The idea of the series is fundamental. Its historical treatment falls into the following stages (1) the fixation of the series or the determination of its contents, (2) the exposition of the systems and schools constituting the series and (3) the interpretation of the series as a whole. The first two stages are preliminary, involving the critical examination of materials and the exposition of the doctrines of individuals and schools. The historian's task proper, begins with the attempt to explain the series as a whole. The leading inquiries here are into the origins of the various national philosophies, their development and their correlations in a world movement. The philosopher here becomes primarily a historian and the terms he deals with are no longer merely systems and schools of thought, but a historic evolution of thought, comprising periods of development, punctuated by points of transition where confluences of streams occur, producing great epochs in the historic evolution of philosophy. There are three typical methods which may be followed in treating the phenomena of this evolution; the dialectical, the physical, and the individual. The dialectical method fixes almost exclusive attention on internal causes and especially on what has been styled the inner dialectic of reason, its tendency to unfold logically in accordance with its own laws. The physical method, on the contrary, emphasizes environing circumstances, laying especial stress on physical conditions and tending strongly toward a mechanical style of explanation. The individual method loses sight, to a great extent, of both internal and external forces of a general character

and tends to regard the personalities of the individual philosophers as the sole determining factors in the philosophical movement.

A more satisfactory method than either of the above is one that unites them all and treats the philosophic movement as a resultant of internal, external and personal forces in co-operation.

In the application of his method the historian of philosophy must not deal exclusively with the order of sequence, but also with that of co-existence. The fortunes of philosophy are bound up with the larger fortunes of humanity, and its development can be understood only in its correlation with other elements of human culture, and above all as a manifestation of that living spirit of man which underlies all historical progress.

The history of philosophy has a double value. It is important in itself as a separate branch of philosophic discipline and as a department of historic science. The student of philosophy also finds it of great value to him, giving him a mastery over the problems of thought and a philosophic insight which he could scarcely acquire from any other source.

[Abstract of paper read before the Philosophical Club, March, 1889.]

SUMMARIES OF PAPERS PUBLISHED.

THE PENTATEUCHAL QUESTION.

By DR. WM. HENRY GREEN,
PROFESSOR OF THE SEMINARY.

The Pentateuchal question is discussed in *Hebraica*, in the double number for January-April, 1889, in reply to Prof. W. R. Harper of Yale in the No. for Oct., 1888. Prof. Harper presents the arguments which have been urged to establish the composite character of the Pentateuch, and the conclusions discrediting its truth and consistency which have been deduced from it. Prof. Green, on the contrary, maintains (1) that the composite character of the Pen-

tateuch might be conceded without prejudice to its truth and consistency; and (2) that the critical attempts to sunder the Pentateuch into distinct documents have not been successful. After some general preliminary remarks upon the inconclusiveness and precarious character of the method of argument employed by the critics to establish their position, Gen. 1—12:5 is minutely examined with the view of testing the allegation of the critics, that two separate writings have here been fused together.

This passage is considered in four sections. The first is Gen. 1-3, which it is contended does not contain, as the critics affirm, a duplicate account of the creation. "The generations of the heaven and of the earth," 2:4 *a*, must mean—as is shown by the form of the Hebrew word, its uniform usage, and the contents of other sections similarly entitled—not their origin, how they were created or brought into being, but their progeny, that which sprang from them, man the child of heaven and earth, his body formed from dust, his spirit breathed into him from God himself. It is not a second account of the creation of the world, that is thus announced, but a narrative of the formation of man and the first stages of his history upon the earth. This conclusion, which is not to be avoided by any critical device, is confirmed by the contents of ch. 2, which, instead of repeating ch. 1, introduces fresh particulars as preliminary to the account of the fall in ch. 3.

And there is no discrepancy between ch. 2 and ch. 1, as has been pretended, in regard to the classification of plants, the need of rain, or the order of creation whether of man and vegetation, or of man and the inferior animals.

The argument for the critical partition of this section on the ground of the alleged diversity in language between 1:1-2:3, which is referred to the document *P*, and

2:4 b—3:24, which is referred to the document *J*, is discussed in detail, and its futility inferred from the lack of significance in lists of words occurring in one passage, which do not chance to occur in the other for the simple reason that there was no occasion to use them; especially when these are words of rare occurrence and give no indication of a writer's habitual diction, or when a use of synonymes in different passages is attributed to the varying habits of distinct writers, while really it is dependent on the shade of thought to be expressed. The significant fact is further pointed out, that the words alleged to be characteristic of *P* in the account of the creation occur in no other *P* section in *Genesis*, unless it be in the narrative of the deluge. If the total absence of all these words from any *P* sections in *Genesis* except those of the creation and deluge does not disprove unity of authorship, how does an absence, not quite so absolute, from *J* sections indicate diversity of authorship? The inconclusiveness of the critical arguments drawn from this section, in the esteem of critics themselves, appears from their not being agreed whether *P* and *J* actually wrote the portions respectively assigned to them. Attention is further drawn to various indications of close relationship and evidently designed correspondence between the paragraphs attributed to *P* and to *J*, which preclude the possibility of their independent origin.

In the second section, *Gen.* 4, 5, critics allege that the similarity of names in the line of descent from Cain and that from Seth proves them to be "practically the same;" that the sentence pronounced upon Cain that he should be a fugitive and a vagabond in the earth is inconsistent with the statement respecting his building a city; and that the mention of the arts invented by Cain's descendants implies ignorance of the fact of the deluge. These

several allegations are contested; the argument for the critical partition from the language of this section and from its duplicate statements is reviewed; and the variance between leading critics as to *J* and *J*¹ is pointed out.

The third section, *Gen.* 6—9, does not contain, as the critics aver, two blended narratives of the deluge; there is in it all no superfluous repetition and no discrepancy; and the language affords no just ground for division. The fourth section, *Gen.* 6: 1—12: 5, is equally free from discrepancies, and from any such differences of language as would sanction the critical partition.

The alternation of Divine names is next considered in its relation to *Ex.* 6: 3 and to the usage in the chapters under review, and is explained from the signification of *Elohim* and *Jehovah* respectively. The critical assertion that "whenever *Elohim* is used, it is accompanied by a certain series of words," is shewn to be unfounded. The theological differences between the sections respectively assigned to *P* and *J* are traced to the distinction observed between the divine names themselves, each of which sets forth the divine being under its own peculiar aspect, and is appropriately employed in connection with the corresponding class of religious ideas rather than with others. The alleged diversity of style either grows directly out of the subject treated, or is for the most part factitious, and has no existence but in the fancy of the critic.

As the result of the investigation, the conclusion is reached that there is nothing in the chapters thus far to militate against either the unity or the Mosaic origin of the book of *Genesis*.

The interesting questions raised by the remarkable correspondence between the deluge tablets and the Scripture narrative are not touched in this paper further

than the expression by the writer of his confident belief that it is impossible to explain the latter as derived from the former.

FUNCTIONS DEFINED BY DIFFERENTIAL EQUATIONS, WITH AN EXTENSION OF THE PUISEUX POLYGON CONSTRUCTION TO THESE EQUATIONS.

By H. B. FINE,

ASSISTANT PROFESSOR OF MATHEMATICS.

A general differential equation whether of the first or higher orders defines y as a function of x , in the sense that corresponding to any initial values of x and y developments may be obtained for the y in powers of x which satisfy the equation.

A given differential equation is then to be regarded as solved when the character of these developments has been determined for it for every pair of initial values of x and y .

Ordinary initial value present no difficulties in the way of making this determination, but those for which coefficients of the equation become infinite or those for which special of the coefficients vanish may present serious difficulties.

The paper under consideration is concerned with the second class of initial values, the problem of which the solution is sought being the following:

Given an equation $f\left(x, y, \frac{dy}{dx}\right) = 0$, or $\Sigma A_i x^{\alpha_i} y^{\beta_i} p^{\gamma_i} = 0$, $p = \frac{dy}{dx}$, which has no term independent of x or y or $\frac{dy}{dx}$; required the degree of the lowest term in each of the developments of y in powers of x which satisfies equation and vanishes with x .

The method used is an extension of the polygon construction used by Puiseux in his study of algebraic functions, and may be briefly stated as follows:

In every case represent by μ the degree of y in respect to x ; by hypothesis that y vanishes with x , $\mu > 0$.

Let $A_1 x^{\alpha_1} y^{\beta_1} p^{\gamma_1}$ be one of the required terms of lowest degree; there must be at least one other term, say $A_2 x^{\alpha_2} y^{\beta_2} p^{\gamma_2}$, of the same degree, and a comparison of the two gives for the corresponding μ the equation $a_1 + \mu\beta_1 + (\mu - 1)\gamma_1 = a_2 + \mu\beta_2 + (\mu - 1)\gamma_2$, whence $\mu = \frac{a_1 - \gamma_1 - (a_2 - \gamma_2)}{\beta_1 + \gamma_1 - (\beta_2 + \gamma_2)}$.

Take two rectangular axes ξ, η , and construct a point $\xi_i = a_i - \gamma_i$, $\eta_i = \beta_i + \gamma_i$ to correspond to each term $A_i x^{\alpha_i} y^{\beta_i} p^{\gamma_i}$. Then the line joining $\xi_1 \eta_1$ and $\xi_2 \eta_2$, viz.

$$\xi - \xi_1 = \frac{a_1 - \gamma_1 - (a_2 - \gamma_2)}{\beta_1 + \gamma_1 - (\beta_2 + \gamma_2)} (\eta - \eta_1) = -\mu (\eta - \eta_1)$$

makes with the η -axis an angle of which the tangent is $-\mu$, and cuts off on the ξ -axis an intercept

$$\xi_1 + \mu\eta_1 = a_1 - \gamma_1 + \mu(\beta_1 + \gamma_1),$$

which is equal to the common degree of the two terms $A_1 x^{\alpha_1} y^{\beta_1} p^{\gamma_1}$, $A_2 x^{\alpha_2} y^{\beta_2} p^{\gamma_2}$.

Since $\mu > 0$ the line makes an oblique angle with the η -axis.

Furthermore, a parallel to this line through any of the other points ξ_i, η_i cuts off on the ξ -axis an intercept $a_i - \gamma_i + \mu(\beta_i + \gamma_i)$, equal to the degree of the corresponding term. If, therefore, $A_1 x^{\alpha_1} y^{\beta_1} p^{\gamma_1}$, $A_2 x^{\alpha_2} y^{\beta_2} p^{\gamma_2}$ be, as was supposed, terms of lowest degree, all the other points must lie to the same side of the line $\xi_1 \eta_1 - \xi_2 \eta_2$ as the origin when its intercept is negative, to the opposite side when its intercept is positive.

Hence to get every admissible group of lowest terms in the equation $\Sigma A_i x^{\alpha_i} y^{\beta_i} p^{\gamma_i} = 0$ —that is, every group of terms for which the corresponding μ is positive and such as to make the terms of the group of lower degree than the remaining terms of the equation—move up a parallel to the η -axis from a position below any of the $\xi_i \eta_i$ points until it meets one of these points or a group of them; next turn it (clockwise, since $\mu > 0$) about the point of this group which

is nearest the ξ -axis until it meets a second point or group of points; again turn it about the point of this second group which is nearest the ξ -axis, and so on until further turning would bring it past the position of parallelism with the ξ -axis.

To each side of the polygon thus constructed—except that parallel to the η -axis, should it occur—correspond one or more developments of y in increasing powers of x , each beginning with the term x^μ and—save in exceptional cases—satisfying the equation $f(x, y, p) = 0$.

A side parallel to the η -axis is to be rejected, since for it $\mu = 0$, or the corresponding y does not vanish with x .

The construction can make a parallel to the ξ -axis a polygon side only in case there be no mere x term in the equation—when $y = 0$ is a solution.

In the paper methods are given also for the determination of the coefficients in the various developments, and the proof is added that the series so obtained are something more than mere formal solutions of the equation—the proof namely that the series converge for a region of finite extent.

Both the polygon construction and the demonstrations are generalized to meet the case of the equation of the n th order

$$f\left(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2}, \dots, \frac{d^ny}{dx^n}\right) = 0.$$

[Abstract of a paper printed in the *Am. Jour. of Math.*, XI. 4].

THE DEARSENIZATION OF CHAMBER ACID.*

By LEROY W. MCCAY,
ASSISTANT PROFESSOR OF CHEMISTRY.

Since publishing my paper, "On the Determination of Arsenic as the Penta-Sulphide," it has occurred to me that the process might be made use of on a large scale for dearsenising the Chamber Acid which is obtained in manufacturing sulphuric acid from arseniferous pyrites.

The unpleasantness connected with the removal of arsenic from Chamber Acid by means of sulphuretted hydrogen gas, is too well known to require special comment. The entire trouble lies, of course, in the enormous quantities of sulphuretted hydrogen gas which have hitherto been found necessary for completely precipitating the arsenic. But a minute fraction of the gas does work, and the result is the unhealthy and disagreeable odor which characterises all establishments where the H_2S -process is in use.

A rational explanation of the action of sulphuretted hydrogen on arsenic acid—and it is in this state of oxidation that the arsenic is present in Chamber Acid—will be found in Fresenius' *Zeitschrift für Analytische Chemie*, 27 Jahrgang, 5. Heft, p. 632, and in more complete form in the *American Chemical Journal*, Vol. x, No. 6, p. 459. I simply refer the reader to these journals. For my present purpose no discussion is necessary.

I suggest then that the method for separating arsenic in the form of pentasulphide, by heating the arseniferous acid with sulphuretted hydrogen in hermetically closed vessels to the temperature of boiling water, be attempted on a large—*i. e.*, a technical scale.

I suppose the process might be conducted in large lead cylinders, which could be heated with steam coils, or the cylinders could be provided with jackets through which steam could be forced. It might be well to arrange the cylinders in such a fashion that, after the precipitation is complete, their contents could be violently agitated. This agitation, experience has proved, serves to coagulate the flocks of the pentasulphide of arsenic and cause the precipitate to settle rapidly and completely, leaving the supernatant fluid clear. The acid might then be syphoned off or filtered. Of course there will always be

* Written for the *Chemiker Zeitung*.

an escape of sulphuretted hydrogen in evaporating the acid, but the amount will here be a minimum.

By means of a thermometer stuck into each cylinder it would be easy to observe the proper temperature—*i. e.*, 100° C., and to avoid any possible danger from over-pressure, the cylinders could be provided with escape valves. The process, on a small scale, has worked so admirably in my laboratory that I cannot see why it should not, on a large scale, work equally well in a sulphuric acid establishment.

At all events I venture to call the attention of acid manufacturers to the rapidity and apparent simplicity and cleanliness of the above process. Perhaps, by means of the ideas here thrown out, it may some day be possible to overcome the many difficulties which at present surround the various methods for extracting arsenic from Chamber Acid.

CONCESSIONS TO SCIENCE.

By George Macloskie,
PROFESSOR OF BIOLOGY.

The cause of Bible Exegesis is indebted to Science for valuable contributions, which are now accepted by expositors of every school. Whilst tenacious for old ways in religion, in which we do not expect a new revelation, we ought to welcome discussions in science, where all nature lies open, with hosts of investigators at work; and as we employ Scripture to explain Scripture in matters of doctrine, we may employ Science to explain Scripture in the things of Science. Yet we ought not to be hasty in attempting conciliations between Science and Scripture; we have been too eager in propounding schemes of harmony which must afterwards be abandoned. Where the case is not clear the non-committal course is best. This is the course followed elsewhere, as between predestination or even foreknowledge and free-will, between

matter and force, body and mind; where all men are willing to accept views which they fail to correlate. The Bible is itself indifferent as to how we interpret natural processes, provided we acknowledge the subjection of all to Divine Providence.

[Printed in *Presbyterian Review*, April, 1889].

AUTOMATIC CONTRIVANCE FOR CUTTING OFF THE GAS WHEN THE FLAME OF BURNERS STRIKES BACK.

By L. W. McCAY,
ASSISTANT PROFESSOR OF CHEMISTRY.

At right angles to the stop cock of the gas pipe is riveted a rod of metal about 20 centimetres in length. To the free end of the rod is attached a piece of small but strong rubber tubing a metre long which can be fastened to any convenient heavy object. The tubing should be pulled taut so that when the rod is revolved, so as to turn on the gas, the rubber shall act as a spring and tend to draw it back. It will be found well to fasten the tubing at such a point that the angle between it, when taut, and the rod shall approximate to 135°. A strong string is also attached to the end of the rod, carried through the air holes and above the inner jet of the burner, pulled tight (thereby stretching the rubber tubing) until a sufficient quantity of gas is on, and then tied fast. The gas is then lit. If the flame of the burner strikes back, the string is burnt through at once, the compensating pull on the rod is destroyed and the rubber tube jerks it back into place and so cuts off the gas.

The arrangement is a very simple one and performs the work for which it was designed in a perfectly satisfactory manner.

Written for the *Chemiker Zeitung*.

MISCELLANIES.

THE ST. GAUDENS BRONZE OF DR. MCCOSH.

The class of 1879 makes a departure this year in its decennial gifts to the College. It will present an heroic portrait in bronze of ex-President McCosh, executed by Augustus St. Gaudens. The statue, for it is nothing less than this, though executed in relief upon a flat groundwork, has been made from numerous sittings lately given to the sculptor by the venerable Scotchman whose most vigorous work for the college was done while the class of '79 was undergoing its course of instruction. He is represented as he looked then, standing beside a reading desk on which one hand rests. The Doctor is in the act of addressing an audience. His right hand extended before him has fallen, with the fingers rigidly extended, in the emphatic manner which was common in his discourses. The head is bent forward. The body balanced evenly upon the legs is mostly concealed by the gown. The head itself is modeled in almost full relief, while the lower portions of the body are less boldly accentuated. The background forms a framework to the whole.

Altogether the figure is a most impressive one. While it is full of massive characterizations, its treatment is simple. The artist's delicate fancy has found free play in the Romanesque surroundings which he uses with such frequency and telling effect. Placed on the wall of the Chapel to the left of the apse, it will be for all time a lasting tribute to the vigorous administration of Dr. McCosh and a worthy record of the best art of the day.

When the class of '79 met a year or more ago to decide upon the form which their memorial should take, it was determined after much discussion that there were two alternatives open. The first of these was the memorial which has been

successfully carried through. The suggestion of it met with a hearty response from all, providing alone that it could be done by the foremost among the sculptors of the day. The other possibility was the foundation of a fellowship of some kind, it matters not what, since the project never went further than this. The artistic purpose for once conquered the scholastic one, and doubtless time will soon condone the fault, if there are those who consider it such. To the ones, at all events, who have so generously made the gift, and it is one of no small value, it appeared that with all the prosperity which has befallen their Alma Mater in recent years, an endowment that has no other purpose in view than to mark and to recall a brilliant past by the best offering that art could devise, was a timely thing to do, and one by no means devoid of usefulness.

HAROLD GODWIN.

THE SEMITIC LANGUAGES IN THE COLLEGE CURRICULUM.

The time has passed when the teaching of Hebrew was well-nigh confined to the Seminaries, and when the other Semitic languages were practically kept out of the regular course of study in our American colleges. Hebrew, Arabic, Syriac and Assyrian are now—one or all—taught at Harvard, Johns Hopkins, Yale, Columbia, University of Pennsylvania, and other institutions, and this branch of philology has in some cases assumed almost as leading a position as has long been conceded to it in nearly all the leading Universities of Europe. This revival has taken place in America during the last ten years, and has been led of late by two most energetic promoters of Semitic studies, Professors Harper of Yale and Peters of Philadelphia.

By the establishment of Hebrew courses at Princeton in the two upper years, it is

expected not only to graduate men who have mastered the philological difficulties of the language sufficiently to use it in critical study, but to establish here at no distant period a flourishing centre of Semitic study. In order to accomplish this, we hope to have the coöperation of the Semitic professors in the Seminary, and to arrange in common with them a comprehensive scheme of graduate study, which must necessarily be of slow growth. It is inevitable, however, that, as it is becoming every day more clear that the Orient was the main source of the ideas involved in the development of the Greek and Roman civilizations, there are additional reasons that it should be given an ever increasing share in our studies. The study of Greek mythology, the origins of Greek history and primitive institutions are but instances where no clear grasp is possible without the light from the East. And, in securing this light, the testimony at first hand furnished by the courses of a special Oriental department have a value even for the development of other departments. Until our graduate department has largely increased, the ideal of a purely philological department cannot be realized. In the meantime, besides teaching Hebrew, we expect to do some work in comparative Semitic philology and to have graduate classes in Arabic, Syriac and Assyrian, as occasion may require. In connection with this department a short course of public lectures will be delivered during the coming year by Prof. Frothingham, who has charge of the department.

THE NEW YORK SCHOOLMASTERS' ASSOCIATION AT PRINCETON.

Pursuant to an invitation from President Patton and the Faculty, the New York Schoolmasters' Association visited Princeton College, Saturday, June 1st. The

delegation on arriving proceeded to the Library Reading Room in the Chancellor Green Library, where they were received by the President of the College and members of the Faculty. President Patton delivered an address of welcome in behalf of the College and touched in his remarks on the various phases of our higher education in which the preparatory schools and colleges have a common interest, dwelling more particularly on the co-ordination of college entrance requirements with the plans of study in preparatory schools. Dr. Sachs, the President of the New York Schoolmasters' Association, followed with a paper bearing on preparatory studies and college requisites for admission as viewed from the standpoint of the schools. Dr. Sachs' paper is printed elsewhere. A discussion then ensued, bearing especially on the matter of the need of more uniformity in college entrance requirements and the means for securing this end. The question of the arrangement of the preparatory Latin and Greek consumed the remainder of the morning session.

An adjournment was taken shortly before one o'clock and luncheon was served in University Hall. The session was resumed at half-past two, and the discussion of the afternoon opened with the consideration of the subjects of mathematics, English and history.

After this the question of the conduct of college entrance examinations, the character of the papers set, the preliminary and local examinations, the offering of papers to test advanced standing, and the adjustment of modern languages in a scheme of entrance requirements were discussed. Shortly after five the session was adjourned.

During the recess after luncheon the members of the Association visited the various buildings and collections of the College.

VISIT OF THE GENERAL ASSEMBLY OF THE PRESBYTERIAN CHURCH TO PRINCETON.

Soon after the opening of Dr. McCosh's administration, the General Assembly of the Presbyterian Church visited Princeton and laid the corner stone of Reunion Hall. This was in May, 1870. After an interval of nineteen years the Assembly again visited Princeton on Saturday, May 25th.

After luncheon in University Hall, which was served immediately upon their arrival, the visitors went in procession to the Marquand Chapel, and were hospitably greeted by the students with the college cheer as they crossed the campus. In the Chapel they were received by the Faculties and Trustees of the College and also of the Theological Seminary.

Ex-President McCosh opened the exercises of the day with prayer and was followed by President Patton in an address of welcome in behalf of the College. A similar welcome was extended by Professor William Henry Green in behalf of the Seminary, and the reply was made by Rev. Dr. Roberts, the Moderator, in behalf of the General Assembly.

A reception at the President's house followed. A large number of the visitors besides inspecting the College and Seminary buildings also visited the old cemetery under the conduct of Professor Cameron.

SUMMER SCIENTIFIC WORK.

The Biological Department will be represented this summer by two Fellows at the Laboratory of the U. S. Fish Commission at Woods Holl, Mass. Their work will be divided between general biological studies and the histological investigation of the various parts of the digestive tract.

In addition to the above, which is but the regular continuance of the practice of

previous years, a new field of scientific work will be occupied by Princeton men during the coming summer. The Fish Commissioner, Col. M. McDonald, has decided to have a careful study made of the waters lying between the Gulf Stream and the New England Coast, in order, if possible, to determine the relation of the changes in temperature of the water to the migration of the schools of fish. These changes in temperature are brought about not only by the effect of the greater summer heat, but also by the seasonal change in the position of the boundary of the Gulf stream. The subject therefore is interesting from a physical as well as a biological standpoint.

A two-masted schooner has been recently fitted up in the most thorough manner for this work and will start upon its work on July 1st from Woods Holl. It is expected that three months will be occupied in the series of investigations planned for this summer. The observations will consist of serial sets, for temperatures and densities, and special biological work upon the forms of life in some of the deeper layers of water of given temperatures. These will be supplemented by a complete meteorological record and a set of observations upon atmospheric electricity, for which the trip offers an especially favorable opportunity.

It is hoped that this work will have a practical value by enabling our New England fishermen to possibly predict where the schools of fish are to be found by observations of the water temperatures. Their scientific value will consist in the determination of the seasonal change in the position of the Gulf stream and in showing the law of increase in temperatures in the area studied, both as regards the surface changes and also those of the deeper waters. A given area has been adopted as the field of work, and the series of observations upon this area will be

repeated a considerable number of times. This field lies directly south of a line drawn from Cape Cod on the East and Montauk Point on the West, and extending fully into the Gulfstream. I shall be assisted in this work by Professors Rockwood and Magie of Princeton, and Prof. McNeill of Lake Forest University.

WILLIAM LIBBEY, JR.

*REPORT FROM THE E. M. MUSEUM OF
GEOLOGY AND ARCHÆOLOGY.*

WILLIAM LIBBEY, JR.,
DIRECTOR OF THE E. M. MUSEUM.

Since the publication of the last BULLETIN, the Museum has been enriched by the addition of another valuable collection of specimens, from the Museum d'Histoire Naturelle of Paris. This series consists of casts of various portions of the skeletons of *Arctocyon Primævus*, *Cynohyænodon Palæotherium Crassum*, *Anoplotherium commune*, *Tapirulus hyracinus*, and *Hipparion gracile*; in all eleven separate casts including many different bones.

In addition to these, the following originals were received at the same time; *Anchytherium Aurelianeuse*, *Hipparion gracile*, *Palæotherium Magnum* and *Medium*, *Aceratherium Sansaniensis*, *Cynodon lacustris*, *Pterodon dasyuroides*, *Anoplotherium Commune*, *Palæomeryx Bojani*, *Dicroceros Elegans* and *Antilope Sansaniensis*, in all fifty-seven portions from eleven different fossil forms.

The value of many of these last named specimens is due to the fact that the beds from which they were obtained are the private property of the Paris Museum and consequently they cannot be obtained in any other manner. We are indebted for this very kind return of fossils in exchange for those sent out by our Museum to the courtesy of the celebrated Prof. A. Gaudry, the Director of the Museum, whose repeated attentions to some of our number

while in Paris will always be remembered as one of the most pleasant experiences of our stay in that delightful city.

*EXAMINATIONS FOR THE DOCTOR'S
DEGREE.*

Mr. Marion Mills Miller (A.B., Princeton, 1886), candidate for the degree of Doctor of Literature, was reported to the Committee on Higher Degrees, on April 18th, 1889, as having presented a satisfactory thesis in the department of English, his chief subject. His final examination was set for April 24th. This examination Mr. Miller successfully passed and was recommended in May by the Faculty for the Degree of Doctor of Literature.

Mr. John Wahl Queen (A.B., Princeton, 1887), Fellow in Historical Science, presented in due time his thesis on "State Interference in Charities," in the department of Political Economy, his chief subject. The thesis was reported by the examining professors April 18th as approved and Mr. Queen was admitted to his final examination May 31st and June 1st. The oral examination in Thucydides, one of his two subsidiary subjects, was conducted by Professor Winans, and that in Political Science, the other subsidiary subject, by Professor Sloane. The President and Professor Johnston were present. On June 1st, Mr. Queen was examined in writing on his chief subject, Political Economy, by Prof. Johnston.

On June 7th the Faculty recommended Mr. Queen for the Degree of Doctor of Philosophy.

NOTES.

The following papers have been read or published by Professor Hunt since the last number of the BULLETIN went to press:

A paper on Matthew Arnold, read at Bryn Mawr, April 9th, 1889.

Euphuism in Literature and Style, in *New Englander and Yale Review*, March 1889.

Hugh Latimer the Homilist, in *Modern Language Notes*, June, 1889.

The Linguistic Study of Literature, in the *Independent*, June 13th, 1889.

Prof. Hunt's edition of *Caedmon* is used in the Higher Local Examinations at the University of Cambridge and also at the Johns Hopkins University.

Professor Orris has received the degree of Doctor of Literature from Lafayette College.

The meeting of the Princeton Alumni Association for the North West was held at Chicago on January 19th. Professor Sloane represented the College.

The annual meeting of the Princeton Alumni Association of the District of Columbia, was held at Washington on February 1st. The President of the College attended the meeting.

The Princeton Alumni Association of North East Pennsylvania held its annual meeting at Wilkes-Barre on February 5th. The President of the College was present.

The Princeton Alumni Association of Maryland held its annual meeting at Baltimore on February 19th. The President of the College was present.

The President lectured recently at the Hartford Theological Seminary on the Carew foundation. The subjects of the lectures were:

1. History of theistic discussion.
2. Genesis of the idea of God.
3. Present state of the theistic argument.
4. Classification and outline of the anti-theistic theories.

The lectures have also been delivered before the Faculty and students of the Drew Theological Seminary.

The annual meeting of the Princeton Alumni Association of Philadelphia and vicinity was held on March 8th. The President of the College, Professors Sloane and Osborn and Dr. Thompson were present.

The eminent Hebraist Dr. Franz Delitzsch of Leipsic, to whom a complimentary copy of the new edition of Professor Green's *Grammar* had been sent, writes:

Herzlichen Dank für das willkommen Geschenk Ihrer neuen Hebrew Grammar und ebenso herzlichen Glückwunsch zu diese Erhebung des bewährten Lehrbuchs auf die höchste Höhe des gegenwärtigen wissenschaftlichen Fortschritts.

In regard to the preference expressed for Preterite and Future as names of the tenses rather than Perfect and Imperfect, which has been criticized in certain quarters, Dr. Delitzsch says:

Die Termen Perfekt und Imperfekt gebrauche auch ich nur accommodationsweise. Wenn man אָהָיָה *ehyeh* für sich nimmt, es Futurum bedeutet *I will be* und nichts anders.

Professor H. C. O. Huss is preparing for Messrs. D. C. Heath & Co., an edition of that part of Goethe's *Dichtung und Wahrheit* which refers to the poet's sojourn at Sesenheim, and his acquaintance with Frederica Brion. The notes, partly lexicographic, partly historical and descriptive, are intended for the use of advanced pupils.

The first two volumes of the *Philobiblon* of Richard de Bury, edited by Professor West for the Grolier Club, and printed by Mr. Theodore De Vinne, have been published. The first volume contains the Latin text and the second the English version. The third volume, which is to contain an introduction with biographical, bibliographical and explanatory matter, will be issued by the autumn. Further notice of this edition will be given in a later number of the BULLETIN.

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